The New England
Journal of Medicine

Copyright, 1942, by the Massachusetts Medical Society

VOLUME 227 OCTOBER 1, 1942 NUMBER 14

CESAREAN SECTION IN MASSACHUSETTS IN 1941

ROBERT L. DENORMANDIE, M.D.

BOSTON

THIS report is the fifth of the five-year study of cesarean sections sponsored by the Massachusetts Department of Public Health and the Section of Obstetrics and Gynecology of the Massachusetts Medical Society.

The usual questionnaires were sent to one hundred and sixty-four maternity hospitals, and replies were received from all.

* * *

In Massachusetts in 1941, there were 71,234 live births and 1796 stillbirths, a total of 73,030. Of these, 63,266 were reported to us as having occurred in hospitals. Two thousand four hundred and thirty-six cesarean sections were performed. One abdominal pregnancy is not included in the statistics. There were 14 hysterotomies, making a total of 2450 abdominal deliveries.

The incidence in 1937 was 1:30.3, in 1938, 1:28.7, in 1939, 1:32.2, in 1940, 1:29.2, and in 1941, 1:29.8.

Little comment is necessary regarding Table 1, except that the number of extraperitoneal operations and of Porro operations increased, being respectively 44 and 41. Six elective and 25 emergency Waters operations were performed. Three patients died in the emergency group; these are commented on below. Of the other types of extraperitoneal operations, 3 were elective and 10 emergency; none of these patients died. All the emergency operations followed long, ineffectual labors. Some of these patients were undoubtedly neglected, but others were under competent supervision of well-trained physicians all the time, and why they were allowed to remain in labor as long as they were is difficult to understand. In at least several of these cases, sulfanilamide was used in the abdominal cavity, and the patients recovered. In the extraperitoneal group, 3 sections were done following failure of operative attempts by vagina. In 1 case, the patient was in labor for twenty-four hours and was transfused four times, and the wound became septic and drained for thirty-seven days. The baby was stillborn and hydrocephalic.

Of the Porro operations, 14 were done for fibroid uterus, 5 because of ruptured uterus, 4 following separated placenta in cases in which the uterus failed to contract, and 3 following failure of operative attempts at delivery from below. In 6 cases, the uterus was atonic, and hysterectomy was performed to save the patient. The remaining 9 cases were done for various other indications.

As shown in Table 2, there were 14 hysterotomies — 6 for cardiac disease and 7 for nephritis or marked hypertension. The final case was reported as one of severe bleeding, no other cause being given. The reason for operation is not clear.

TABLE 1. *Summary of Abdominal Deliveries.*

OPERATION		NO. OF CASES
Cesarean section		2436
Emergency	1126	
Elective	1309	
Not reported	1	
Type of operation:		
Low	1336	
Classical	1009	
Waters or extraperitoneal	44	
Porro	41	
Not reported	6	
In labor	806	
Not in labor	1601	
Not reported	29	
Membranes ruptured	387	
Membranes unruptured	2014	
Not reported	35	
Hysterotomy		14
Total		2450

TABLE 2. *Indications for Hysterotomy.*

INDICATION	NO. OF CASES
Cardiac disease	6
Nephritis	6
Hypertension	1
Severe bleeding	1
Total	14

In Table 3, which lists the types of anesthesia used, the great increase in the use of spinal anesthesia is interesting. Nitrous oxide, oxygen and ether is still the first choice, and the use of cyclopropane has dropped.

TABLE 3. *Types of Anesthesia.*

ANESTHETIC	NO. OF CASES
Nitrous oxide, oxygen and ether	1244
Ether	272
Cyclopropane	166
Spinal	641
Nitrous oxide and oxygen	8
Local	62
Other	30
Not reported	13
Total	2436

Table 4 shows the reported indications for operations in which the baby died. As in previous years, the greatest number of babies were lost from placenta previa and separated placenta. It should be noted that 18 babies were lost following previous sections. The reason for these deaths in almost all cases was that the operation was done because the patient went into labor or ruptured her membranes at about the seventh month. Some of the babies, however, were full term, and it is difficult to explain why they were lost, although one must always realize that even in delivery by vagina a certain number of infants die. It is to be expected that many of the babies in emergency sections die because of hard labor or for other good reasons that can hardly be blamed on the operation. But the loss of so many babies in elective sections raises the question whether the technic was satisfactory or whether the operations were done at the proper time in the gestation.

TABLE 4. *Indications for Operation in Cases with Death of the Baby.*

INDICATION	EMERGENCY CESAREAN SECTION	ELECTIVE CESAREAN SECTION
Placenta previa	49	2
Separated placenta	48	–
Previous cesarean section	10	18
Toxemia	6	10
Disproportion	10	5
Prolonged or inefficient labor	6	–
Obstructing tumor (fibroids)	3	1
Failure of operative attempts	3	–
Malposition	2	1
Fetal distress	2	–
Previous suspension	2	–
Ruptured uterus	2	–
Previous dead baby	–	2
Cardiac disease	1	1
Diabetes	1	–
Tuberculosis	–	1
Eclampsia	1	–
Prolapsed uterus	1	–
Prolapsed cord	1	–
Spastic uterus	1	–
Hydramnios	1	–
Previous third-degree tear	–	1
Labial varices	–	1
Postmaturity	–	1
Surgical emergency	1	–
Bizarre	–	1
Not reported	–	4
Totals	151	49

Table 5 presents the detailed indications for cesarean section. The same comment is made on this group of cases that has been made in the other reports.

In many cases of placenta previa, the patient could have been delivered exactly as well if not better by vagina, and it is hard to believe that the indications "contracted pelvis" and "disproportion" were valid when the babies were found to weigh only 5 or 6 pounds. This happened in too many cases. One cannot help believing that it seemed to the operator the easiest way to terminate a slow labor.

TABLE 5. *Indications for Cesarean Section.*

INDICATION		NO. OF CASES
Previous section		722
Contracted pelvis and disproportion		491
Placenta previa		237
Separated placenta		106
Toxemia		114
Eclampsia		8
Malposition of baby		109
	Breech 88	
	Transverse 15	
	Face 4	
	Shoulder 1	
	Oblique 1	
Dystocia		247
	Dystocia 34	
	Labor without progress 38	
	Test of labor 110	
	Cervical dystocia 46	
	Uterine inertia 18	
	Contraction ring 1	
Previous surgical operation		50
	Repair of perineum 22	
	Amputation of cervix 12	
	Previous uterine operation 15	
	Previous rectal operation 1	
Associated medical condition		45
	Cardiac disease 17	
	Tuberculosis 4	
	Diabetes 16	
	Chronic nephritis 4	
	Friedrich's ataxia 1	
	Blood dyscrasia 1	
	Ankylosed hip 2	
Previous obstetric disaster		76
Elderly primipara		58
Obstructing tumor (fibroids)		44
Fetal distress		11
Prolapsed cord		7
Following operative attempt		10
By request or for sterilization		10
Ruptured uterus		6
	Spontaneous 2	
	Previous section 4	
Bicornate uterus		7
Postmaturity		8
Malformation of fetus		1
Fractured pelvis		1
Surgical emergency		1
Labial varix		1
Prolapse of uterus		1
Congenital dislocation of femur		1
Twins		5
Error in diagnosis		1
Bizarre		19
Not reported		39
Total		2436

There were 8 cases of eclampsia, with 4 deaths. Again, it is obvious that the prenatal care of these women was inadequate. Whether it was the fault of the patient or of the doctor in charge, there is no way to determine, but the loss of 50 per cent of the cases is surely a very poor result.

Few comments are necessary on the remaining indications. In this, as in previous reports, the indication "following operative attempts" has had to be recorded. Criticism must again be made of surgeons who perform a cesarean section simply at the request of the patient or for purposes of sterilization, without any other adequate reason.

It is interesting that in a case of spontaneous rupture of the uterus, the patient had had in a previous pregnancy an inverted uterus for which a Spinelli operation was done. She went through this pregnancy satisfactorily until near term, when the uterus ruptured in the line of the old Spinelli incision. She was immediately operated on and recovered.

In 5 cases, the recorded indication was "twins." This does not mean that these were the only cases of twins, but in these cases no other indication was given. It is doubtful if these operations were in any way necessary. It should also be noted that in 1 case a large baby was suspected, no x-ray film was taken, a cesarean section was done, and twins were delivered.

Every year, there are a number of cases for bizarre indications on which there seems no need for further comment.

Table 6 presents a summary of the 52 cases in which maternal death occurred, a mortality rate of 2.1 per cent. As in previous years, emergency operations accounted for the greatest number of deaths. The fact that elective operations resulted in the death of 16 patients shows that cesarean section is not always a safe procedure. In these 52 cases, 40 babies lived, and 12 were lost. In 1941, the deaths following classical sections were far more numerous than those after the low type of operation. In previous years, the division has been nearly equal.

TABLE 6. *Summary of Cases with Maternal Death.*

DATA	NO. OF CASES
Emergency operation	36
Elective operation	16
Type of operation:	
Low	16
Classical	30
Porro	3
Waters	3
In labor	20
Not in labor	32
Membranes ruptured	13
Membranes unruptured	39
Babies:	
Living	40
Dead	12

Of the 3 Porro operations resulting in death, all were done because of bleeding, and 2 were complicated by the presence of placenta accreta. Two of these deaths are classified as due to hemorrhage, and 1 is assigned to sepsis.

The three Waters operations in the group of maternal deaths were done after long labors with ruptured membranes. One death is assigned to pulmonary edema, 1 to hemorrhage, and 1 to sepsis. The patient who died from hemorrhage was transfused eight times.

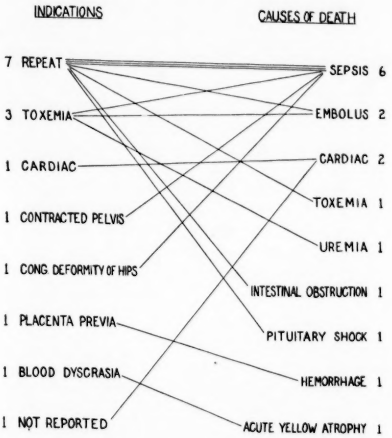

FIGURE 1. *Maternal Deaths in 16 Elective Cesarean Sections.*

Figures 1 and 2 present the indications for operation and the causes of death in the elective and the emergency cesarean sections, respectively.

Of the 16 deaths following elective sections, 6 were from sepsis. Criticism must again be directed at the surgeons who lost these 6 cases. Of the 3 toxemic cases, 1 patient died of an embolus and the other 2 might well be classified under the toxemias, but in 1 of these the patient failed to excrete any urine and the physician regarded the cause of dea h as uremia.

The patient who died from intestinal obstruction had a large hernia as the result of a previous cesarean operation. The present operation was performed without complications. During convalescence, there was some vomiting, and a Levine tube was used without relief. The vomiting became worse. Apparently, a pneumonia developed

in the right base, and the patient died without relief of the intestinal obstruction. Autopsy showed that there was incarceration of loops of the small intestines resulting from the old hernia. It seems from the facts presented in the questionnaire that this case was not handled intelligently.

The death from hemorrhage occurred in a patient with placenta previa who had had nine previous normal deliveries and who had been in the hospital for fifty days, spotting occasionally.

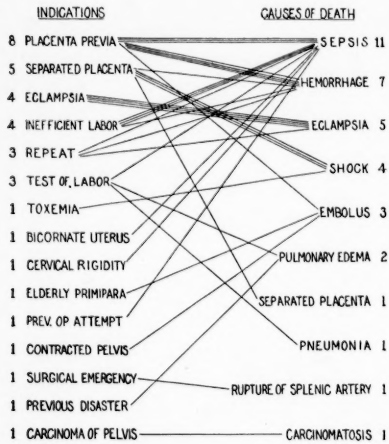

FIGURE 2. *Maternal Deaths in 36 Emergency Cesarean Sections.*

Operation was finally decided on, and an elective section was done. The patient went into shock and died of hemorrhage. It seems hardly reasonable to have delayed operation for fifty days with more or less spotting occurring all the time. This surely must be regarded as a preventable death.

The case in which the indication is "not reported" is the only case of death in the five-year study on which we have been unable to secure an intelligent, complete report. Repeated efforts to obtain the facts in this case have been unsuccessful. The questionnaire was returned with the statement that it was an elective section and that the cause of death was "acute cardiac dilatation precipitated by vasomotor collapse." No comment on this diagnosis is necessary.

The patient with blood dyscrasia had an unusual blood picture, bleeding from the mucous membranes and vomiting a large amount of blood. In spite of all treatment, she steadily failed.

Of the 36 deaths that followed emergency sections, sepsis again was responsible for the greatest number. One case in this group that warrants examination had as an indication "cervical rigidity." This patient, a forty-year-old primigravida, was said to be two weeks overdue, and for this reason, an attempt at induction of labor was made. Castor oil and pituitary extract were given in small doses, but the attempt was unsuccessful. Two days later, the membranes were ruptured manually, and a Voorhees bag was introduced with considerable difficulty. It was stated that the cervix was hard to dilate, and that the bag promptly came out. The patient had only indefinite labor, and following a consultation a cesarean section was decided on. A low transverse section was done. At the time of operation, the temperature was 99.6°F. The following day, it rose to 101°F., and climbed steadily until death occurred from sepsis on the eighth postoperative day. This appears to be a typical case of meddlesome midwifery. There was obviously no indication to induce labor, for the patient was perfectly well and the cervix was not favorable for induction. The only reason given was that she was two weeks beyond her calculated date. On failure of medical induction, mechanical induction was attempted. It was obvious when the Voorhees bag was expelled so quickly that the surgeon had not placed it within the uterus. This case is a tragic illustration of the fact that so long as physicians attempt to induce labor without the ability to judge whether or not the patient is ready for induction, bad results are inevitable. It is cases such as this that keep the death rate higher than necessary.

Two deaths, those with indications "surgical emergency" and "carcinoma of the pelvis," cannot be attributed to obstetric complications.

* * *

The results obtained in the cesarean sections in 1941 were excellent, as they were during the entire five-year study. However, they could and should have been better, for it is obvious that many of the deaths were preventable. Far too many deaths are still occurring from sepsis. There is obviously altogether too much haphazard operating. This situation can be improved only by careful study of each case and the mapping out of as definite a procedure as possible for its management. As has been said repeatedly in these reports, cesarean section is an easy way out of a difficulty, but too often has fatal results.

CARCINOMA OF THE BRONCHUS*

GEORGE W. HOLMES, M.D.†

BOSTON

THIS presentation is based on a review of the recent literature, a study of the 158 proved cases treated at this hospital and reported by King,[1, 2] Churchill[3] and Adams and Davenport,[4] and an examination of the records of 68 additional cases seen from November 1, 1940, to March 1, 1942, inclusive. The latter group was selected for more intensive study because it was made up of patients who were seen during a period when the methods of diagnosis and treatment were better understood and when supervoltage x-rays were available for the treatment of nonsurgical cases.

Since early, correct diagnosis is of paramount importance and since the number of patients reaching the surgeon at a time when surgical cure is possible is very small, I have limited this discussion largely to the roentgenologic findings in the early stages of the disease and to its treatment with the roentgen rays.

GENERAL CONSIDERATIONS

Cancer of the bronchus is not a rare disease, occurring about as often as cancer of the rectum. The present operative mortality is not formidable, being approximately that of cancer of the stomach. Five-year surgical cures have been obtained in 4 to 6 per cent of cases. In this series, there were no five-year cures by irradiation although several cases are reported in the literature; however, this method of treatment offers much in the way of relief of symptoms and, in some cases, of definite prolongation of life.

The progress of the disease is usually rapid, its duration from the date of the first symptom to death being a matter of months rather than years. For this reason, early diagnosis and prompt treatment are imperative; the delay of a month before institution of treatment may mean the difference between success and failure. It is a disease of men (rarely of women), usually in the so-called "cancer age." The early symptoms and signs are not characteristic and may be entirely absent. The late symptoms are those of its complications, and when they occur the disease is, as a rule, incurable.

Roentgenologic examination often gives the first clue to a correct diagnosis and should be so conducted that all possible information is obtained. The responsibility of the roentgenologist in these cases is great. The diagnosis is established by bronchoscopy, thoracoscopy or surgical exploration, and these procedures should not be delayed when the clinical and roentgenologic findings suggest early bronchial cancer. The type of tumor, as determined from a specimen taken at bronchoscopy, is of great consequence in the decision of what form of treatment should be undertaken. Oat-cell and undifferentiated carcinomas are radiosensitive tumors and usually disappear locally under this form of treatment, whereas the surgical results in the same groups have been uniformly bad. Adenomas and the slower growing types of malignant tumors are radioresistant, but often show excellent results when treated surgically. Consequently, a biopsy should be obtained whenever possible. Advanced cases with lung necrosis or empyema are probably made worse by intensive irradiation and should be treated surgically, if at all.

STATISTICAL DATA

In the 68 cases observed since November, 1940, histologic classification was as follows: epidermoid carcinoma, 26 cases; adenocarcinoma, 4 cases; oat-cell carcinoma, 8 cases; undifferentiated carcinoma, 6 cases; unclassified, 14 cases; and without biopsy, 10 cases. At the end of March, 1942, 45 of the 68 patients were known to be dead, 8 were living, and 15 could not be traced. Ten of the entire group were considered favorable for surgical treatment. Of these, 3 were living when last heard from, but their present status is unknown. During the same period, 47 patients were selected for irradiation. Of these, 8 were living on April 1, 1942: 2 were free from evidence of disease, 4 were symptomatically improved, and 2 were in the terminal stage of the disease. The remaining 11 patients received no special treatment. The average duration of life for the 45 patients known to be dead, from the time diagnosis was established until death, whether they received special treatment or not, was four and a half months. For the 8 known to be living, the average lapse of time since the diagnosis was established is five and a third months.

The effectiveness of irradiation as a palliative measure in selected cases is difficult to express in figures, and can be shown best by the following two cases.

*Presented at the annual meeting of the Massachusetts Medical Society, Boston, May 27, 1942.

From the Department of Radiology, Massachusetts General Hospital.

†Radiologist, Massachusetts General Hospital.

CASE 1. A 63-year-old man was admitted to the hospital on July 24, 1941, with a story of having been ill for 9 months. The illness had started with "pneumonia." The patient had lost 50 pounds in weight, and had a productive cough, which was severe, particularly at night. He complained of pain in the right shoulder, and difficulty in breathing when lying down.

Examination on admission showed cyanosis, without evidence of dilatation of the superficial veins; the breath sounds were slightly diminished over the entire chest, and the whispered voice was not transmitted. Dullness to percussion and tactile fremitus were absent. X-ray examination showed a lobulated mass in the region of the right hilum, with diminished aeration throughout the entire right lung field. These findings were considered to be consistent with primary bronchogenic carcinoma. The x-ray diagnosis was confirmed by bronchoscopy, and a biopsy taken at this examination showed oat-cell carcinoma.

X-ray therapy was advised, and the first treatment was given on August 5, 3 days after a definite diagnosis had been established. The treatment was given through two portals, one front and one back, centered over the mass; supervoltage x-rays were used. The patient received a total of 3000 r to the anterior and 2900 r to the posterior right chest. Treatments were given through a 12-by-12 cm. field in daily doses of 300 r. During the treatment, the patient developed a spiking temperature, which did not return to normal until 5 days after treatment was completed. In September, he received an additional 1500 r to each area. From that time on, improvement was continuous, and a second bronchoscopy with biopsy, done on December 12, 4 months after the treatment was begun, failed to show any evidence of disease. At the time of his last visit, April 22, 1942, the patient had no complaints, had gained considerable weight and was doing some work.

Comment. This patient had a very malignant, rapidly growing, radiosensitive tumor. He appeared for examination rather late in the course of the disease, but the diagnosis was made within 10 days, treatment was given promptly, and the immediate results were excellent.

CASE 2. A 64-year-old man was admitted to the hospital on June 10, 1941, complaining of cough and generalized weakness of 5 months' duration. The cough was productive of small amounts of blood-streaked sputum. The patient had a feeling of pressure in the left chest, some dyspnea and an intermittent wheeze, and had lost weight.

On examination, the chest appeared emphysematous, the trachea and heart being displaced to the left; the breath sounds were harsh on the left, but there were no rales or areas of dullness. X-ray examination showed collapse of the left upper lobe, with a marked shift of the trachea and mediastinum to the left. The cause of the obstruction was not clear. On June 16, bronchoscopic examination revealed a tumor at the orifice of the left-upper-lobe bronchus. The biopsy diagnosis was epidermoid carcinoma, Grade III.

Because of the patient's age and generally poor condition, surgery was not advised. He was not started on x-ray treatment until August 22, over a month after the diagnosis was made. The reason for the delay is not clear from the record. The treatment was given through two 10-by-10 cm. fields, one anterior and one posterior over the tumor. The daily dose was 300 r, and the total dose to each field 3000 r; supervoltage x-rays were used. Following the treatment, there was disappearance of symptoms, and an x-ray examination on December 3 showed re-expansion of the collapsed lobe and no visible tumor. A second bronchoscopic examination on December 5 showed no visible tumor; a biopsy was negative.

When last seen, on April 8, 1942, the patient was symptom free and looked well. X-ray examination, however, showed a small, rounded mass in the left 2nd interspace which may have been a recurrence.

Comment. This patient's life was made more comfortable and probably has been considerably prolonged by the treatment. Possibly, a better result could have been obtained if the delay between diagnosis and treatment had been avoided.

In both cases there is fairly definite evidence that it is possible to destroy the primary tumor with the treatment used.

DISCUSSION

Since the roentgenologic examination plays such a major part in the early diagnosis of cancer of the bronchus, I have attempted to group the cases according to their anatomic and histologic diagnosis in the hope that a better understanding of the basic pathological picture would improve the interpretation of the roentgenologic findings. Figure 1 is a schematic representation of the pathologic findings as demonstrated on the films. It is obvious that the roentgenologic appearance depends on the following factors: the location of the tumor, the type of tumor, the stage of the disease and the complications present.

The tumor may develop in one of the larger bronchi or in any of their more distal bifurcations, and its location determines whether it is seen as a central or peripheral shadow. It may grow outward into the lung substance, forming a more or less rounded, dense mass, with displacement of the adjoining bronchi away from the mass, or it may extend into the bronchial lumen, causing partial or complete obstruction of the bronchus. The latter type of tumor is more difficult to demonstrate roentgenologically, but it can often be seen as a mass within the bronchial lumen on films taken with the Bucky-Potter diaphragm, with the planograph, or after the injection of lipiodol.

More frequently, the presence of a tumor is suspected from the obstruction that it causes. The roentgenologic sign of bronchial obstruction varies with the degree of obstruction. When obstruction is partial, air enters the affected lung area with each inspiration, but its exit is prevented by the decrease in the bronchial lumen during expiration, and the area beyond the bronchial plug appears on the screen or film as a localized area of emphysema. If the obstruction is in a major bronchus, a shift of the heart and mediastinum away from the affected bronchus

occurs during expiration. This sign of bronchial obstruction is best demonstrated on films taken at the end of the expiratory phase, and may be entirely missed when the examination is confined to films taken at full inspiration. As the lesion increases in size, and obstruction of the bronchus becomes more complete, one of the three following changes may take place in the area of lung supplied by the plugged bronchus:

A persistent, low-grade pneumonitis may develop, appearing on the film as an area of homogeneous density corresponding in size and shape to the portion of the lung supplied by the involved bronchus.

The part of the lung beyond the plug may become water-logged (the so-called "drowned lung"), with subsequent infection, necrosis and abscess formation. In such cases, the shadow

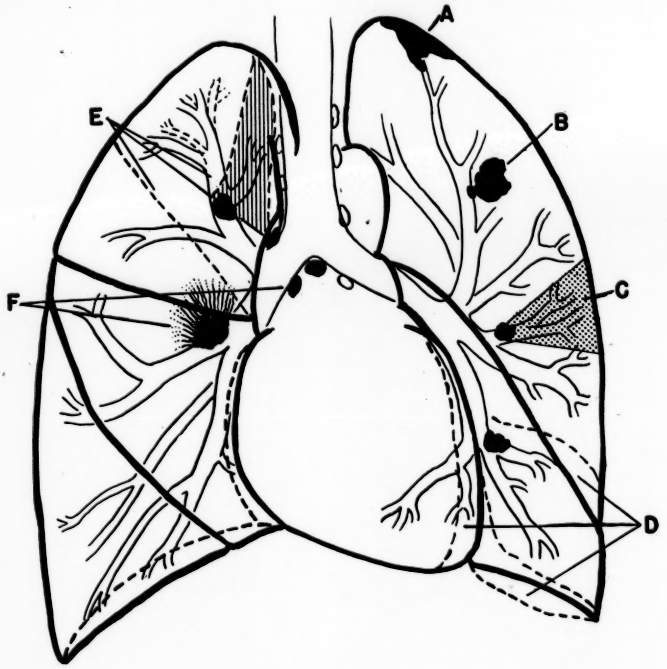

FIGURE 1.

A — *Early apical tumor arising in a terminal bronchus, often called "Pancoast tumor"; early symptoms — pain in the shoulder and, sometimes, Horner syndrome; diagnosis made by aspiration biopsy.* B — *Extraluminal bronchial tumor; symptoms and physical signs absent; diagnosis made by surgical exploration.* C — *Intraluminal bronchial tumor causing obstruction and obstruction pneumonitis; symptoms — cough and sometimes bloody sputum; diagnosis made by bronchoscopy.* D — *Intraluminal tumor causing partial obstruction, ball-valve type, with localized emphysema; symptoms — same as in* C; *diagnosis made by bronchoscopy.* E — *Intramural tumor causing complete obstruction with collapse of the right upper lobe; symptoms — cough, blood spitting and, sometimes, dyspnea; diagnosis made by bronchoscopy.* F — *Rapidly growing tumor with extension to regional nodes, with or without signs of bronchial obstruction; symptoms — same as in* E; *diagnosis made by bronchoscopy.*

seen on the film may have a somewhat mottled appearance, and cavities containing fluid levels may be demonstrated.

There may be a more or less complete collapse of the lung distal to the plug. The roentgenologic appearance varies according to the size of the area involved, the completeness of the collapse and the length of time it is present. These collapsed areas are usually seen best in the lateral view of the chest, when they appear as band-like or triangular areas of increased density replacing a lobe or a portion of a lobe. The lung adjoining the diseased area is unusually bright, owing to compensatory emphysema. The interlobar septums, when visible, are displaced toward the collapsed area. When an entire lobe is involved and the process is not of too long standing, there is a shift of the heart and mediastinum toward the affected side during inspiration.

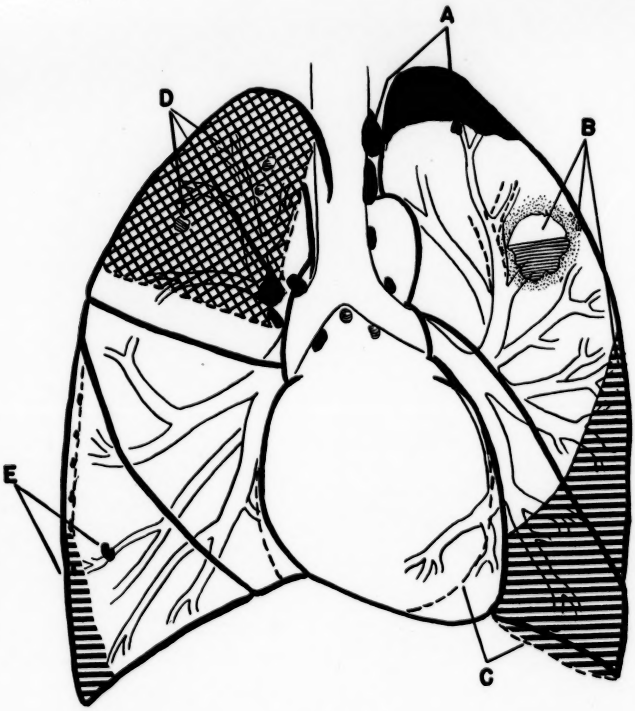

FIGURE 2.

A — *Advanced apical tumor with extension to pleura and regional nodes; symptoms — cough, pain in shoulder, radiating down arm, and, usually, Horner syndrome; sometimes, signs of phrenic-nerve paralysis.* B *and* C — *Large extraluminal tumor with necrotic center, involvement of the pleura, fluid in the pleural space and foul and often bloody sputum; pieces of tumor may be coughed up; may be mistaken for lung abscess.* D — *Intraluminal tumor with complete block and drowned or necrotic lung, which may contain small cavities; sputum may be foul; fever and other signs of infection present.* E — *Small peripheral tumor with direct extension to the pleura; pleuritic pain and small amount of fluid in the pleural space; diagnosis made by thoracoscopy.*

Removal of the plug may result in a return of the lung to its normal appearance. It should not be forgotten that the commonest cause of bronchial obstruction is not carcinoma, or that a benign adenoma may be confused with a malignant tumor.

The histologic characteristics of the tumor play a part in determining the roentgenologic appearance, but a less significant one than the location of the tumor. The oat-cell and undifferentiated carcinomas rarely if ever produce rounded, sharply defined masses outside the bronchial lumen, although they not infrequently involve the lung, being seen as poorly defined, irregular shadows extending outward from the affected bronchus.

When the disease is far advanced, after it has extended beyond the regional lymph nodes, or when there is widespread infection with fluid in the pleural space, the picture is dominated by these secondary manifestations, and roentgenologic examination may be of little value in determining the underlying cause. At this point, reliance should be placed on other methods of diagnosis.

A knowledge of the usual distribution of the metastases in carcinoma of the bronchus is of considerable advantage in the interpretation of the roentgenologic findings and of the clinical symptoms. Enlargement of the peribronchial and peritracheal lymph nodes occurs relatively early, and should always be looked for. This enlargement is of diagnostic value and has a direct bearing on the question of operability. Extension to the pleural surfaces seems to occur more frequently when the tumor arises in a minor bronchus or when it is situated near one of the interlobar septums. With massive involvement of the peritracheal lymph nodes, the phrenic nerve may be involved, and roentgenologic examination will show, in addition to the enlarged nodes, a paralysis of the diaphragm on the affected side. When the pleura is involved, there is usually evidence of fluid in the pleural space, and nodules on the pleural surface can sometimes be demonstrated after artificial pneumothorax. Clinically, these patients complain of pleural pain, and if the process is at the apex they may have a Horner syndrome. Metastasis to bone is not uncommon, but the roentgenologic appearance does not differ materially from that seen in other metastatic bone tumors. Metastasis to the brain, liver, adrenal glands or mesenteric lymph nodes occurs very often, and may give rather characteristic symptoms, although the masses are not usually demonstrated on the film. When the disease is complicated by an extensive infectious process, the roentgenologic appearance is that of infection, and the underlying tumor may be overlooked. The differentiation of these tumors from other obstructing lesions of the bronchi, from pulmonary metastasis of tumors arising in other parts of the body and from benign tumors of the bronchi is largely dependent on the clinical history and the bronchoscopic examination. The worth of roentgenologic examination is in the demonstration of a lesion consistent with carcinoma of the bronchus to the end that other more complicated diagnostic methods may be undertaken.

Before these patients are subjected to irradiation, the diagnosis should be definitely established, preferably by biopsy. Benign tumors should be ruled out, since the surgical results in this group are excellent and only harm can result from irradiation. No case in which there is a reasonable chance of complete surgical removal should receive roentgenologic treatment, and cases in which extensive metastases have already occurred, or in which massive infection is present, are probably better treated by other means.

The cases in which benefit from irradiation may be expected are those with oat-cell or undifferentiated carcinoma without definite evidence of metastasis beyond the regional lymph nodes, and the rather large group of cases with roentgenologic evidence of bronchial obstruction and symptoms of cough, blood spitting and fever. In the latter group, it is essential that irradiation be confined to the tumor tissue, the infected lung beyond the tumor being avoided. With destruction of the tumor, the bronchial obstruction is relieved, the lung re-expands, and the symptoms disappear. Since many of these tumors are radioresistant, the dose must be large — about 3000 to 5000 r, given in the region of the tumor. To avoid irradiation of the surrounding, often infected lung, the field must be small, and the number of portals limited. Supervoltage rays are of distinct advantage in the carrying out of this plan of treatment.

* * *

If, in this presentation, I have seemed to place undue emphasis on the use of the roentgen ray in the diagnosis and treatment of bronchogenic carcinoma, it is not because I do not appreciate that medicine and surgery play the major part in the problem, but because the roentgen ray is the part in which I am most interested and because it has received less attention. The medical and surgical aspects have been covered thoroughly by other physicians at the Massachusetts General Hospital, and I am very much indebted to them for permission to use their material.

References

1. King, D. S. Primary cancer of the lung. *New Eng. J. Med.* 219:828-833, 1938.
2. *Idem.* Treatment of diseases of the lower respiratory tract. In *The Therapeutics of Internal Diseases.* Vol. 3. 738 pp. New York: D. Appleton-Century Co., 1941.
3. Churchill, E. D. Resection of the lung. *Surgery* 8:961-991, 1940.
4. Adams, R. C., and Davenport, L. F. The technic of bronchography and a system of bronchial nomenclature. *J. A. M. A.* 118:111-116, 1942.

Additional References

Casilli, A. R., and White, H. J. Rare forms of primary malignant lung tumors. *Am. J. Clin. Path.* 10:623-641, 1940.

Craver, L. F. Bronchiogenic carcinoma. *Am. J. Roentgenol.* 43:469-478, 1940.

Idem. Diagnosis of malignant lung tumors by aspiration biopsy and by sputum examination. *Surgery* 8:947-960, 1940.

Fariñas, P. L. Recent progress in the bronchographic examination of bronchogenic carcinoma. *Am. J. Roentgenol.* 44:370-385, 1940.

Halpert, B. Morphologic aspects of carcinoma of the lung. *Surgery* 8:903-909, 1940.

Harrington, S. W. Pneumonectomy for carcinoma of the lung. *J. Thoracic Surg.* 11:396-404, 1942.

Holinger, P., and Radner, D. B. Bronchoscopic diagnosis of bronchial carcinoma. *Surgery* 8:939-946, 1940.

Moore, S. Body-section radiography in malignancy of the lower respiratory tract. *Surgery* 8:924-938, 1940.

Neuhof, H., Rabin, C. B., and Sarot, I. A. A topographic classification of cancer of the lung, with special reference to the surgical implications of the circumscribed variety. *J. Thoracic Surg.* 11:388-395, 1942.

Ochsner, A., and DeBakey, M. Surgical considerations of primary carcinoma of the lung. *Surgery* 8:992-1023, 1940.

Idem. Significance of metastasis in primary carcinoma of the lungs. *J. Thoracic Surg.* 11:357-387, 1942.

Olds, J. W., and Kirklin, B. R. Primary carcinoma of the lung: a roentgenologic study of 206 proved cases. *Am. J. Roentgenol.* 44:357-369, 1940.

Shenstone, N. S. Experiences with total pneumonectomy. *J. Thoracic Surg.* 11:405-413, 1942.

Singer, J. J. Primary bronchiogenic carcinoma. *Surgery* 8:910-923, 1940.

THE PLACE OF GASTRODUODENOSTOMY IN THE SURGERY OF DUODENAL ULCER*

HOWARD M. CLUTE, M.D.,† AND JOHN S. SPRAGUE, M.D.‡

BOSTON

FOR some years, the consensus has been that simple duodenal ulcer is primarily a medical problem, and it is well known that 80 to 90 per cent of duodenal ulcers can be satisfactorily managed by medical treatment. When complications occur in the course of a duodenal ulcer, however, surgery is necessary. The chief complications of duodenal ulcer that may require surgery are acute perforation, hemorrhage, pyloric obstruction and a failure of medical measures to give satisfactory relief of symptoms.

In past years, the majority of surgeons employed a short-circuiting operation for duodenal ulcers that had developed any of the above complications. In many cases, lasting relief was obtained by this procedure. As time went on, however, it became increasingly evident that the frequency of gastrojejunal ulceration after posterior gastroenterostomy was great and that this lesion was more trying than the original ulcer. Surgical opinion turned more and more to subtotal gastrectomy as the procedure of choice in complicated ulcers. It is now generally believed that, when possible, a resection of two-thirds or more of the stomach, which must include the pylorus, is best in the treatment of duodenal ulcers with hemorrhage or intractable to medical treatment. We are in complete accord with this opinion. In our clinic, patients with duodenal ulcers who have failed to gain relief from careful medical treatment are subjected to radical subtotal gastrectomy; patients who have had repeated hemorrhages from the duodenal ulcer are likewise subjected to gastric resection when operative interference is deemed necessary.

In 1938, we§ described the technic and reported the results in a small group of cases of duodenal ulcer in which a gastroduodenostomy, instead of a posterior gastroenterostomy, had been performed. The results were uniformly good, but we realized that sufficient time had not elapsed after the operation to make the report especially significant.

The 15 cases reported in 1938 and 11 more cases since then have been followed to date. It is our opinion that we are beginning to have some definite information regarding the dangers and complications that may follow gastroduodenostomy and the benefits that one may anticipate from this procedure. From these facts, the indications for gastroduodenostomy in certain duodenal ulcers may be decided.

In our experience, pyloric stenosis following a long-standing duodenal ulcer is completely and permanently relieved by gastroduodenostomy. For many years, it has been known that the best results of posterior gastroenterostomy have followed its use as a short-circuiting procedure in duodenal ulcers that had produced a fibrous stenosis of the pylorus. The question arises, Why should one use gastroduodenostomy in these cases instead of the time-tried posterior gastroenterostomy? We prefer gastroduodenostomy because it is more easily and simply performed and has less immediate postoperative complications. Furthermore, in our cases, there has not been, as yet, even a suggestion of later jejunal ulceration. Finally, it

*From the Surgical Service, Massachusetts Memorial Hospitals.

†Professor of surgery, Boston University School of Medicine; surgeon-in-chief, Massachusetts Memorial Hospitals.

‡Assistant in surgery, Boston University School of Medicine; assistant surgeon, Massachusetts Memorial Hospitals.

§Clute, H. M., and Sprague, J. S. Gastroduodenostomy for certain duodenal ulcers. *J. A. M. A.* 111:909-914, 1938.

has long seemed to us that normal physiology was more closely approximated when the acid gastric contents were emptied into the second part of the duodenum than when they were poured into the jejunum.

In the previous paper, we reported 7 patients with pyloric stenosis treated by gastroduodenostomy. We have recently re-examined all these patients. They are without exception perfectly well, so far as their digestive apparatus is concerned. They eat as they wish, and have no indigestion or distress. Since our last report, we have done eleven more gastroduodenostomies for pyloric stenosis; all these patients are well, with no digestive troubles. Thus, 16 patients with obstructing duodenal ulcers have been treated with gastroduodenostomies and followed from a few months to seven years with such satisfactory results that we are deeply impressed. We realize that this is a small group of patients and that half of them have been followed less than five years. However, this carefully followed group does give a definite suggestion that gastroduodenostomy may be preferable to other short-circuiting operations in obstructing duodenal ulcers. We are completely satisfied that the procedure is preferable to subtotal gastric resection for these patients, who are usually old and whose body chemistry is seriously altered by their pyloric stenosis.

We have used gastroduodenostomy in the surgical management of two gastrojejunal ulcers that followed posterior gastroenterostomy. One of these patients was fifty-five and the other fifty-nine years of age. Both entered the hospital with active, serious hemorrhage from the gastrojejunal ulceration and presented a very serious surgical problem. We agree that the ideal procedure in the management of gastrojejunal ulcer is: removal of the loop of jejunum and its stoma from the stomach; closure of the jejunum by suture of the orifice or end-to-end anastomosis; resection of the stomach and performance of an anterior or posterior Polya type of anastomosis.

The third part of the procedure, in our experience, may be more than the patient can safely bear, since this resection must follow the removal of the jejunum from the stomach and its suture. We know that it is dangerous to remove the jejunum, close it and close the gastric defect, and do nothing to the duodenum, even though the duodenal ulcer seems to be quiescent. Reactivation of the duodenal ulcer, with hemorrhage, perforation or obstruction, occurs too frequently under these conditions. In these 2 patients, treated seven and six years ago, a gastroduodenostomy was quickly and readily done after the bleeding gastrojejunal ulcer was excised and the stomach and jejunum closed. Both patients have been followed to date and are quite free from digestive troubles. We believe that, under circumstances such as these, gastroduodenostomy rather than partial gastrectomy may be a lifesaving procedure. We shall have no hesitation in carrying out this operation in future patients with gastrojejunal ulcers who are poor risks.

We do not consider gastroduodenostomy the method of choice for the surgical management of a bleeding duodenal ulcer, in which resection of the ulcer and a radical resection of the stomach should be done, if any surgery is undertaken. We did a gastroduodenostomy for a bleeding duodenal ulcer in 1935. The patient died a few hours after operation. This is the only death we have ever had following gastroduodenostomy. In 1936, we did a second gastroduodenostomy for a duodenal ulcer with repeated hemorrhages. This patient is well, six years later, and has no digestive trouble.

We do not believe that gastroduodenostomy is a procedure of choice in the surgery of gastric ulcer, although we have twice used it in conjunction with local excision of the lesion. Both patients are now well, one seven years and the other four years after operation. In each of these cases, the ulcer was very high on the lesser curvature of the stomach, and its removal would have necessitated almost a total gastric resection. One of the patients has had several trying bouts with recurrent gastric ulcer since operation, but since he is now well he will not consider reoperation. The other patient has remained well. It is perhaps true that in certain very high gastric ulcers, local excision of the ulcer and gastroduodenostomy will prove satisfactory, but, in general, a radical subtotal gastrectomy is preferred in these cases.

Certain duodenal ulcers cause distress and disability in spite of long-continued and careful medical treatment. These patients, in our opinion, should have radical subtotal gastric resections and neither posterior gastroenterostomy nor gastroduodenostomy. In such patients, high gastric acidity is common preoperatively and gastrojejunal ulceration postoperatively, unless the gastric antrum and most of the acid-secreting gastric glands are removed surgically.

We have done gastroduodenostomies in 4 patients because of the failure of medical treatment. One of these patients — and the only case in our series — cannot be traced. Two have remained well and have no digestive troubles four and five years, respectively, after operation. The fourth patient has about as much indigestion now as she did before operation, and she represents the only known failure in the series. Since operation, she has gone through a divorce and has also lost her mother. Her diet is entirely unsatisfactory. We are

at present following her in the Gastro-Intestinal Out Patient Department with the hope that a proper diet will give relief. There is no evidence of a stomal ulcer in this case. We have every reason to believe that our own judgment was at fault in selecting the surgical procedure.

SUMMARY

Twenty-six gastroduodenostomies have been performed for the complications of duodenal ulcer, with one death. One case has been lost, but the remaining 24 have been followed to date.

In 16 cases of organic pyloric stenosis, the results have been so entirely satisfactory that we have been greatly impressed with the value of the operation in this condition.

Two patients with bleeding gastrojejunal ulcers were treated by resection of the jejunal ulcer and closure of the jejunum and stomach; a gastroduodenostomy instead of a gastric resection was done because of their condition. Both patients have remained well for many years. Under these circumstances, we believe gastroduodenostomy may frequently be a lifesaving procedure.

We do not recommend gastroduodenostomy for the treatment of serious hemorrhage from duodenal ulcer or when medical treatment has failed; subtotal gastric resection is the operation of choice for these conditions.

Only rarely is gastroduodenostomy, in combination with local excision of an ulcer high on the lesser curvature of the stomach, employed. In some cases, however, this conservative procedure may well be preferable to a total or nearly total gastrectomy for these lesions.

In our experience, gastroduodenostomy is even more easily done than posterior gastroenterostomy, and certainly the patients have a smoother postoperative course. No gastrojejunal ulceration has followed gastroduodenostomy in our experience. This seems logical, since in gastroduodenostomy the acid gastric secretion empties into the duodenum, which is prepared for it, rather than into the jejunum, which is not.

CLINICAL NOTE

A DEVICE FOR THE INTERNAL FIXATION OF BONE

LYMAN SMITH, M.D.*

BARRINGTON, ILLINOIS

INTERNAL fixation of bone is rapidly coming into more general use in the treatment of fractures. The surgical and physiologic problems have been fairly well solved. The mechanical aspects of this engineering problem, however, are of equal importance and have recently been receiving an increasing measure of attention. In 1938, Hawley and Padula[1] introduced an angle plate that does not bend; Murray[2] advocated the use of a transfixion screw crossing the fracture site in conjunction with the usual plate. Lyon, Cochran and Smith[3] tested the holding power of various types of screws used in bone and determined the correct size of drill for each. All this work was directed toward increasing, as much as possible, the efficiency of the internal immobilization. It is the purpose of this paper to present a device that is mechanically more efficient than the screws in present-day use.

The device, illustrated in Figure 1, is a screw-type expansion sleeve.† It consists of two parts: a small screw threaded about half its length, and a sleeve member into which the screw is seated. The sleeve is slit into four sections, which are so tapered that, when the leading point of the screw engages them, they are forced open and thus form a wedge.

Up to the present time, this device has been used only in cancellous bone, to which it is applied in the following manner: a 6/32-inch hole is drilled to the desired depth, and an expansion sleeve of the proper length is then selected and inserted into the drill hole; the head of the sleeve is grasped with a forceps to prevent rotation, and the screw member is then seated with a small screw driver.

Delay in obtaining machine tools has prevented its use in cortical bone. Obviously, the sleeve sections of the device cannot expand against such hard material as cortical bone; instead, therefore, one must use a tool that will enter a drill hole on the exposed surface of a bone and ream out a wider bore below the surface, equaling the diameter of the expansion sleeve. One such instrument has been designed and used experimentally, but is not yet perfected.

The mechanical principle underlying the expansion sleeve is not new, since similar fasteners are used in cement and brickwork.

The holding power of a nail or screw in soft cancellous bone is not great. In experimental animals, however, these sleeves averaged 40 per cent more holding power in cancellous bone than

*Formerly, resident, Bone and Joint Service, Boston City Hospital.

†The development of this device is due, in large part, to the generous co-operation of the Illinois Tool Company, Chicago.

a coarse deep-threaded screw. This added fixation is of advantage in allowing early motion after the screw, whereas the opposite is true of the expansion sleeve. For this reason, absorption of

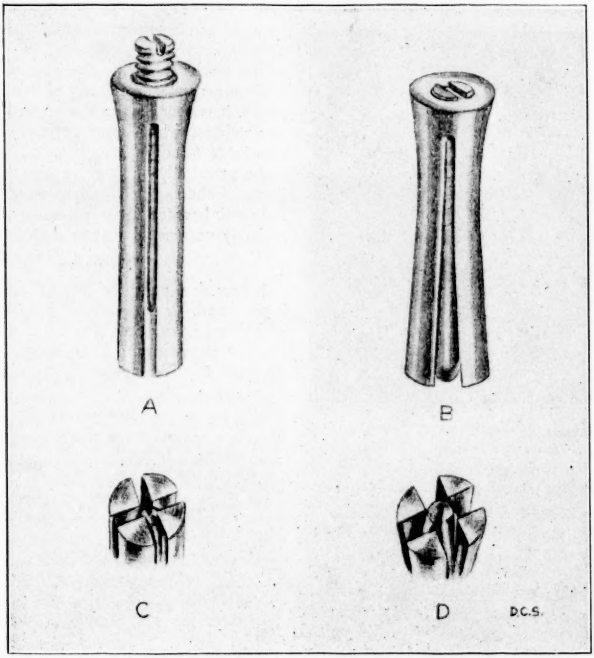

FIGURE 1. *Screw-Type Expansion Sleeve.*

A — Expansion sleeve closed; screw not seated. B — *Expansion sleeve opened; screw seated, forcing sleeve sections open.* C — *Distal end closed.* D — *Distal end opened.*

reduction, which is desirable in fractures around joints.

Venable, Stuck and Beach[4] have proved that erosion of bone around screws made of alloys, other than vitallium, is caused by electrolytic irritation. The stresses produced about a screw, however, also result in absorption of bone and subsequent loosening. Figure 2 illustrates the stresses around a screw and around an expansion sleeve, both used to fasten together two pieces of Marblette, a phenol resin plastic that has a high photoelastic property to show strain effects produced by concentration of pressure. The magnitude of these stresses is dependent on the number of dark and light lines concentrated at any one point or area. The photograph shows that the stresses are very prominent and concentrated about

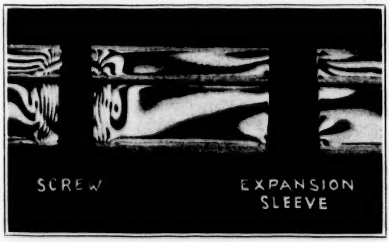

FIGURE 2. *Lines of Stress about a Screw and an Expansion Sleeve.*

bone about the expansion sleeve is slower and less marked than that about a screw.

Removal of an expansion sleeve weeks after insertion, when it had served its purpose, might be thought difficult because of the formation of

FIGURE 3. *Expansion Sleeve Six Weeks after Insertion in a Dog's Femur.*

callus between the screw member and the expanded sleeve sections. This has not proved to be so. Figure 3 shows an expansion sleeve buried for six weeks in the greater trochanter of a dog's femur. There was no absorption of bone about the sleeve, which, on examination, was found to be seated firmly. After the screw member had been turned out, the sleeve was easily extracted. Expansion sleeves in place as long as ten weeks have likewise been easily removed.

Since accurate machining of this device is necessary, it cannot be made from such a hard alloy as vitallium, which must be cast. However, the new S-Mo (Enduro) stainless steel has been found to be practically as inert in the tissues as vitallium. If the expansion sleeve were manufactured from stainless steel in large numbers, its cost would probably not exceed that of a vitallium screw.

SUMMARY

A new device for the internal fixation of bone is presented. It is simple to apply, exhibits greater holding power than a screw and creates fewer lines of stress in the bone about it. It has no apparent disadvantages.

Brinker Road

REFERENCES

1. Hawley, G. W., and Padula, R. D. A bone plate which will not break or bend. *J. Bone and Joint Surg.* **20**:469-472, 1938.
2. Murray, C. R. Primary operative fixation in fractures of the long bones in adults. *Am. J. Surg.* **51**:739, 1941.
3. Lyon, W. F., Cochran, J. R., and Smith, L. Actual holding power of various screws in bone. *Ann. Surg.* **114**:376-384, 1941.
4. Venable, C. S., Stuck, W. G., and Beach, A. The effects on bone of the presence of metals: based on electrolysis: experimental study. *Ann. Surg.* **105**:917-938, 1937.

MEDICAL PROGRESS

CARCINOMA OF THE PROSTATE

WILLIAM C. QUINBY, M.D.*

BOSTON

ANY consideration of the subject of carcinoma of the prostate must emphasize once again the frequency of its occurrence in all men past the age of fifty years. From the clinical viewpoint, it has long been recognized that in about 20 per cent of all male patients of this age who have symptoms of prostatism, these symptoms are found to be due to a prostatic carcinoma. More recent inquiry into the incidence of prostatic carcinoma comes from routine post-mortem examination by the pathologist, by which additional cases of cancer are demonstrated in many patients dying from various other conditions who showed no evidence of prostatic carcinoma during life. Thus, Moore[1] finds carcinoma of the prostate in 17 per cent of all men over fifty years, and this incidence increases steadily with age, until it reaches 29 per cent in patients who are in the ninth decade. The disease probably originates in cells that have previously undergone atrophy of a senile type. A more recent study of this subject by Kahler[2] at the Mayo Clinic has given similar figures. His observations were derived from 195 cases. In 72, the diagnosis was made ante mortem; in 69, the carcinoma was discovered only at autopsy; and in 54, it was found only by a more detailed study of sections in cases that had previously been considered benign both clinically and pathologically. The clinical diagnosis was made by palpation in 23 cases, by palpation and biopsy in 30 cases, and by the presence of characteristic distant metastases in 19 cases. The average age of these patients

Reprints of articles in this series are not available for distribution, but the articles will be published in book form. The current volume is *Medical Progress: Annual, Vol. III, 1942* (Springfield, Illinois: Charles C Thomas Company, 1942 $5.00).

*Clinical professor of genitourinary surgery, emeritus; urological consultant, Peter Bent Brigham Hospital.

was sixty-five years, and the total incidence of carcinoma 17.3 per cent. Of tumors recognized either clinically or grossly at necropsy, 54 per cent had produced metastases. So far as the point of origin of the neoplasm in the prostate is concerned the lateral and posterior lobes were most frequently involved. The growth never arose in the median lobe. In several cases, its origin appeared to be "multicentric." The type of tumor was squamous cell in 3 per cent of the cases and adenocarcinoma in the others, whose malignancy was classified as Grades I and II in 69 per cent. This, of course, reflects the clinical experience that prostatic cancer is a slowly growing type of tumor on the whole, spreading most frequently by metastases, rather than by invasion of contiguous structures.

Regarding the manner of extension of the original growth, the perineural lymphatics were found to contain cells in all cases in which the tumor was of the more malignant types — Grades III and IV — and in 91 per cent of all tumors investigated, regardless of type. Therefore, if one considers this evidence conclusive, one must agree with Kahler that "it makes very questionable the possibility of operative cure." Moore[1] also called attention to this frequent invasion of the perineural lymphatics, even in early stages of the disease. Further investigation into the mode of spread of carcinoma of the prostate has been carried out by Warren and his co-workers.[3] Although transport by means of the blood stream is undoubted, they believe that the perineural lymphatics offer the tumor an additional way of access to bone and that this fact accounts for the marked frequency with which the bony pelvis and lower vertebras become involved, as compared with regions more distant from the tumor.

Such observations as these, combined with the insidious progress of the growth that makes early clinical recognition of its presence infrequent, have led to a rather widespread attitude of defeatism concerning the operative treatment of prostatic carcinoma, which is often unjustified. It is to be remembered always that the pathologist can describe with accuracy only what he sees in the individual microscopic slide. Beyond this, conclusions regarding cause and effect may easily be fallacious. It is wrong, for example, to assume that a tumor cell lying apparently free in a tissue space surrounding a nerve is undergoing transport in a direction away from its point of origin. Furthermore, the term "perineural lymphatic" is not at all accurate, for the accepted connotation of "lymphatic" is that of a tubular structure walled by endothelial cells, a part of the general lymphatic apparatus of the body. The implication is that there is a progression of the fluid or lymph contained in such a lymphatic in the direction of the more central areas of the body, the current being similar to, although slower than, that in the capillaries leading to veins. The areas about the very numerous sympathetic nerve fibrils with which the prostate is supplied are really only tissue spaces — lymph spaces, possibly, but certainly not true lymphatics. That a cancer cell lying in such a space about a nerve fibril will be viable on transportation to some distant point of the body, or is even being so transported, is not proved by any evidence at hand. Metastasis by way of the blood stream, especially by the veins, is of course acknowledged, but that these cells in proximity to nerve fibrils play a significant part in the spread of the neoplasm is yet to be demonstrated. Certainly, the clinical evidence afforded by the recorded cures after total prostatectomy, together with the well-known slow progress of prostatic carcinoma in general, suggests strongly that this perineural invasion is of little prognostic significance. The observations of Warren and his associates were derived from autopsy and thus represent only the terminal picture of the malignant process.

A valuable aid in the study of prostatic carcinoma has been the result of examination into its relation to the enzyme phosphatase present in tissues and appearing also in the serum of the blood. This enzyme, acting as a catalyst, has the power of liberating phosphate ions from phosphoric acid esters. The amount so liberated depends on the reaction of the solution in which it takes place. Thus, the optimum pH for the alkaline phosphatase is 8.6, whereas that for the acid phosphatase is 4.8 to 5.0. The reaction is expressed in units per 100 cc. of blood serum.

Following the demonstration on phosphatase by Bodansky[4] and that by Kutscher and Wolbergs,[5] which showed that prostatic tissue contains a large amount of acid phosphatase and but little alkaline phosphatase, the Gutmans[6] have studied this subject extensively. They found that the prostate in the newborn contained 4.5 units per gram of tissue; that of a boy of four years, 1.5 units; and that of a boy of thirteen years, 73 units; whereas the prostate of the adult man showed much greater phosphate activity, varying from 522 to 2284 units. Evidently, therefore, the content of the prostate in phosphatase bears a definite relation to its maturity, increasing markedly after puberty and represents a secondary sex characteristic of a chemical nature. In the blood serum of normal persons, the amount of acid phosphatase activity was found to be from 0.5 to 2.5 units per 100 cc. In patients with bone metastases from prostatic carcinoma,

however, a very marked increase in the amount of acid phosphatase in the blood serum takes place, whereas in the serum of patients with prostatic carcinoma but no metastases, the phosphatase readings are normal.

Gomori[7] has devised special staining methods by which it is possible to demonstrate phosphatase in tissues. Prostates containing carcinoma when so stained show an abundant black deposit, owing to the large amount of phosphatase present.

The important studies on the relation of the prostate to the various endocrines, and especially to the sex hormones, undertaken by Huggins and his collaborators[8–13] at the University of Chicago have had an especially significant result in the field of therapy of carcinoma of this gland. An operation was devised by which the prostate of dogs was separated from the urinary tract so that prostatic activity could be studied over long periods in response to various conditions or injections. Determination of prostatic activity was made after the collection for one hour of the secretion caused by an injection of 6 mg. of pilocarpine. Castration of such dogs was followed by marked and increasing reduction and eventual cessation of the prostatic secretion in from seven to twenty-three days. After this, the secretion could be reestablished by the injection of testosterone. This depression of prostatic secretion after removal of the testes, well recognized for years in both man and animals, therefore depends on the reduction of the male sex hormones, the androgens, of whose greatest amount the testis is the origin. The concept then followed that prostatic carcinoma, being composed of epithelial cells of a mature type, might be responsive to a depression of the androgenic hormones in the organism, in common with all other types of adult prostatic epithelium. Using the phosphatase estimation as a method of objective proof of the concept, these workers found that androgen injection caused a marked rise of acid phosphatase in patients with prostatic carcinoma and that castration or estrogen (female sex hormone) injection produced a sharp decrease in the activity of the phosphatase.

Twenty-one patients with advanced prostatic cancer were castrated, and the clinical effects observed during twenty months. Four of the men died, and in 2 the clinical results were reported as unsatisfactory. The authors further state:

> In those patients who were improved the more objective clinical evidence of tumor regression consisted of increased appetite and a progressive gain in weight; improvement in red cell and hemoglobin values; decrease in pain and objective neurological symptoms (2 patients who had compression of the cauda equina with a complete block of the subarachnoid space had a restoration of the circulation of cerebrospinal fluid and resolution of the paralytic and anesthetic changes following castration); decrease in the size of the primary tumor on rectal palpation and at cystoscopic examination; stabilization or regression of bony metastases in roentgenograms; and a decrease in the size of palpable lymph nodes which were the site of metastatic cancer. It was our opinion that complete regression of the tumor had not taken place, although the depression of the tumor activity with resulting improvement of the patient in some cases was considerable. In about 20 per cent of the cases the results were unsatisfactory. Further observations found that the administration of stilbestrol reduced still further the level of the acid phosphatase below that reached after castration. Estrogen is therefore found to supplement the action of lowering the androgens of the body brought about by castration.

Following this very important report made at the meeting of the American Urological Association in May, 1941, many patients with prostatic carcinoma have been subjected to orchidectomy, with results that in some cases have been quite phenomenal. The most striking benefit was usually the relief of conditions caused by the metastases; in several well-authenticated cases, the patient, partially paralyzed by pressure on the spinal cord and nerve roots, was freed from pain and again able to walk. That orchidectomy does not result in a total resolution of the cancer in the prostate itself seems to be generally acknowledged. Nevertheless, there is no doubt that this procedure relieves many of the most prostrating symptoms of the sufferers.

Other methods of reducing the androgens in the body are exposure of the testes to the destructive action of the x-ray and the use of an estrogen, such as diethylstilbestrol. Munger[14] reports a series of cases of prostatic carcinoma treated by resection followed by irradiation of the testes. He believes that such x-ray treatment has given some added benefit, but his results do not seem very convincing. Herrold[15] reports 12 patients with cancer of the prostate to whom diethylstilbestrol was given. A consistent result was seen in the relief of pain. Also, the patients showed an improvement in general condition and, in some cases, a gain in weight. Rectal palpation in one patient who had taken the drug to the amount of 350 mg. during a period of five and a half months showed a diminution in the size of the growth of about 50 per cent and a diminution in its hardness. Pain in the breasts, with some increase in size (gynecomastia), was the only untoward result of the administration of the drug in daily doses of 3 mg. The effects following testicular irradiation or diethylstilbestrol, however, in no case are reported to be so outstanding as those seen after orchidectomy.

It is of interest, in view of the newer knowledge of the sex hormones and their effect on castration, to consult the early opinions concerning this procedure as a method of treating the enlarged and

obstructing prostate. Before the American Surgical Society, in 1893, White[16] read a paper advocating orchidectomy for the hypertrophied prostate after having demonstrated that this operation causes atrophy of the prostate in dogs. Three years later, Cabot[17] presented to the same society an analysis of the clinical results of this operation in man. No distinction was made between a benign and a malignant hyperplasia of the prostate. The results on the whole were poor, although an occasional case was found in which the improvement in the patient's condition and ability to empty the bladder was marked. It was probably the malignant prostate in which a favorable reaction to operation was obtained.

Those who advocate total removal of the gland whenever possible are increasing steadily. There is no longer any doubt of the excellent results of such removal in cases in which the diagnosis has been made sufficiently early. The recent papers of Colston[18] and of Lowsley and Kilgore[19] bear witness to this fact. For patients in whom the carcinomatous invasion is too extensive to permit a total prostatectomy, resection of the obstructing portions by way of the urethra is of inestimable value, as brought out in the paper of Wishard, Hamer and Mertz.[20] The use of radium either in the form of the salt or as emanations in "seeds," rather general a few years ago, today finds fewer advocates.

* * *

Recent advances in the knowledge of the biologic characteristics of carcinoma of the prostate have already resulted in markedly increasing ability to relieve the symptoms of sufferers from this disease. A defeatist attitude today is entirely unjustified.

Continued emphasis must be placed on the early detection of the carcinomatous prostate by rectal examination of men fifty years of age and older as an important part of an annual physical examination. Because of the insidious progress of this disease, in no other way will the number of cases amenable to total removal of the gland be increased, and to date this is the only method of cure.

A more general use of the biopsy in every suspected case is strongly advised, even though at times this necessitates an exposure of the prostate through the perineum.

Patients with prostatic carcinoma should be studied at frequent intervals, both before and after operation, by estimation of the phosphatase activity of the blood serum and by x-ray study of the spine and pelvis as indices of their condition.

The growth of prostatic carcinoma is retarded by a reduction of the amount of androgenic substances present in the body. Such a reduction is brought about primarily by castration, and secondarily, and to a much less degree, by the administration of one of the estrogens, preferably diethylstilbestrol.

A suggested course of treatment of patients with prostatic carcinoma is as follows: for patients with few or no urinary symptoms but with an amount of carcinomatous invasion too extensive to permit total prostatectomy, castration, followed by diethylstilbestrol is advised; for those with obstructive symptoms and a degree of malignant invasion too extensive for total prostatectomy, transurethral resection, combined with castration, is preferred; in patients for whom total prostatectomy can be done but who already have metastases, prostatectomy, followed at least by stilbestrol, and possibly by castration if the acid phosphatase remains high, should be performed; patients amenable to radical excision of the gland should have operation, followed by careful observation of the phosphatase readings, castration being reserved until high values of this enzyme indicate its need.

References

1. Moore, R. A. The morphology of small prostatic carcinoma. *J. Urol.* 33:224-234, 1935.
2. Kahler, J. E. Carcinoma of the prostate gland: a pathologic study. *J. Urol.* 41:557-574, 1939.
3. Warren, S., Harris, P. N., and Graves, R. C. Osseous metastasis of carcinoma of the prostate, with special reference to the perineural lymphatics. *Arch. Path.* 22:139-160, 1936.
4. Bodansky, A. Phosphatase studies: determination of serum phosphatase. *J. Biol. Chem.* 101:93-104, 1933.
5. Kutscher, W., and Wolbergs, A. Prostataphosphatase. *Ztschr. f. physiol. Chem.* 236:237-240, 1935.
6. Gutman, A. B., and Gutman, E. B. An "acid" phosphatase occurring in the serum of patients with metastasizing carcinoma of the prostate gland. *J. Clin. Investigation* 17:473-478, 1938.
7. Gomori, G. Microtechnical demonstration of phosphatase in tissue sections. *Proc. Soc. Exper. Biol. & Med.* 42:23-26, 1939. Distribution of acid phosphatase in the tissues under normal and under pathologic conditions. *Arch. Path.* 32:189-199, 1941.
8. Huggins, C., and Hodges, C. V. Studies on prostatic cancer. I. The effect of castration, of estrogen and of androgen injection on serum phosphatases in metastatic carcinoma of the prostate. *Cancer Research* 1:293-297, 1941.
9. Huggins, C., Stevens, R. E., Jr., and Hodges, C. V. Studies on prostatic cancer. II. The effects of castration on advanced carcinoma of the prostate. *Arch. Surg.* 43:209-223, 1941.
10. Huggins, C., Scott, W. W., and Hodges, C. V. Studies on prostatic cancer. III. The effects of fever, of desoxycorticosterone and of estrogen on clinical patients with metastatic carcinoma of the prostate. *J. Urol.* 46:997-1006, 1941.
11. Huggins, C., Masina, M. H., Eichelberger, L., and Wharton, J. D. Quantitative studies of prostatic secretion. I. Characteristics of the normal secretion: the influence of thyroid, suprarenal, and testis extirpation and androgen substitution on the prostatic output. *J. Exper. Med.* 70:543-556, 1939.
12. Huggins, C., and Clark, P. J. Quantitative studies of prostatic secretion. II. The effect of castration and of estrogen injection on the normal and hyperplastic prostate glands of dogs. *J. Exper. Med.* 72:747-761, 1940.
13. Huggins, C., and Stevens, R. A. The effect of castration on benign hypertrophy of the prostate in man. *J. Urol.* 43:705-714, 1940.
14. Munger, A. D. Experiences in the treatment of carcinoma of the prostate with irradiation of the testicles. *J. Urol.* 46:1007-1011, 1941.
15. Herrold, R. D. Discussion on treatment of carcinoma of the prostate. *J. Urol.* 46:1016, 1941.
16. White, J. W. The present position of the surgery of the hypertrophied prostate. *Ann. Surg.* 18:152-188, 1893.
17. Cabot, A. T. The question of castration for enlarged prostate. *Ann. Surg.* 24:265-285, 1896.
18. Colston, J. A. C. The surgical treatment of carcinoma of the prostate. *New Eng. J. Med.* 223:205-214, 1940.
19. Lowsley, O. S., and Kilgore, R. N. Total perineal prostatectomy: a modification of a previously published technic. *J. Urol.* 45:196-201, 1941.
20. Wishard, W. N., Jr., Hamer, H. G., and Mertz, H. O. Transurethral resection in the treatment of carcinoma of the prostate. *J. Urol.* 42:1088-1100, 1939.

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

CASE 28401

PRESENTATION OF CASE

First admission. A six-month-old male infant was admitted to the hospital because of cough, vomiting and a shrill cry.

Three weeks prior to entry, the child began to vomit his feedings immediately after ingestion. During this time, he developed a cough productive of small amounts of sputum. This did not occur in paroxysms and was not similar to the cough of whooping cough. However, vomiting often occurred after coughing. The physician did not find the temperature elevated, but the child seemed to perspire, particularly about the head. The symptoms were unaffected by variation in the feeding formula. During the three days before admission, the child vomited everything consumed, and the vomiting was termed "almost projectile." He became quite constipated and lost 2 pounds.

The family history was irrelevant. Two siblings, aged four and two years respectively, were well.

Born at term after a normal spontaneous delivery, the patient was declared "a small baby," but was vigorous and quite normal. The development was normal, and the diet adequate.

Physical examination revealed a pale, poorly nourished, slightly dehydrated, weak, flabby infant with a high-pitched, feeble cry. The throat was slightly congested and filled with mucus. The heart and lungs were normal. The abdomen was soft and scaphoid. The liver edge was felt 1 or 2 cm. below the costal margin. Neurologic examination was negative.

The temperature was 99.2°F., the pulse 150, and the respirations 30.

Examination of the blood revealed a red-cell count of 2,350,000 with a hemoglobin of 40 per cent, and a white-cell count of 7400 with 43 per cent polymorphonuclears and 57 per cent lymphocytes; the hematocrit was 23 per cent. The blood Hinton reaction was negative. Examination of the urine was negative. X-ray examination of the long bones, skull and chest was negative. The tuberculin test was negative.

The child was treated with physiologic saline infusions, blood transfusions and a gradually increased formula. The anemia cleared. The patient was discharged after seventeen days, apparently improved.

Second admission (eight days later). The mother stated that on the day of discharge from the hospital she noticed that the patient's fingers and toes were blue. On the second day after discharge, he began to vomit after feedings, although the hospital formula was followed. At times, a refeeding was not vomited, and water could be tolerated. The patient lost interest in his toys, lay quietly and fussed when picked up. A week later, he was found breathing with difficulty, and the fingers were blue. This became progressively worse, and a day later, he was readmitted to the hospital. He was said to have gained 12 ounces since discharge.

Physical examination revealed a pale, fretful, slightly dehydrated infant, who showed little interest in his surroundings and who cried when moved. The face and nail beds of the fingers and toes were blue. The fontanels were soft and were not sunken. The throat was moderately congested and filled with mucus.

Examination of the heart revealed only a tic-tac rhythm. The lungs seemed clear anteriorly, but showers of fine rales were heard in both upper lobes posteriorly and the chest seemed dull to flat in these areas. The abdomen was somewhat protuberant and tympanitic, and the umbilicus protruded. The liver edge was felt 3 cm. below the costal margin. The spleen was not felt.

The temperature was 102°F., the pulse 160, and the respirations 60 to 80.

Examination of the blood revealed a red-cell count of 4,000,000 with a hemoglobin of 87 per cent, and a white-cell count of 51,000 with 55 per cent polymorphonuclears. The following day, the white-cell count was 18,400 with 79 per cent polymorphonuclears. There was a marked anisocytosis, and many normoblasts were present on the blood smears. There was no sickling of the red cells. In the fragility test, no hemolysis occurred at 0.50 per cent, and at 0.25 per cent there was complete hemolysis. The carbon dioxide combining power was 15.7 milliequiv. per liter, and the nonprotein nitrogen was 20 mg. per 100 cc. The throat and stool cultures were negative for pathogenic organisms.

X-ray films of the bones showed no evidence of disease. The chest was described as being unusually large. The diaphragm was low in position. The size and shape of the heart showed no variation from the normal. No unusual masses were seen. The trachea and main bronchi were

clearly visible and appeared normal. In the fluoroscopic examination, the mediastinum appeared shifted to the left, but there was no respiratory change. The pulmonary markings were increased on both sides.

An electrocardiogram on the second day after admission showed a sinoauricular tachycardia, with a rate of 150 per minute. The PR interval was 0.12 second. There was a moderate right-axis deviation. Electrocardiographic studies done three and twelve days later revealed no significant change.

The patient was maintained quite well in an oxygen tent but became quite cyanotic when removed. On the eighth day, the red-cell count was 5,100,000 with 100 per cent hemoglobin, and the white-cell count was 11,200. He continued to gain weight. A marked pitting edema was noted on the eleventh hospital day, and clubbing of the fingers seemed to have developed. The liver became enlarged until the edge was felt at the crest of the ilium. On the day of death, the patient was removed from the oxygen tent for a bath. He became quite cyanotic and remained so after being returned to the oxygen tent, contrary to what had previously occurred. He died forty-five minutes after being returned to the tent.

Differential Diagnosis

Dr. Conger Williams: In summary, this infant entered the hospital for the first time because of an acute episode characterized by vomiting, cough and severe anemia from which he apparently recovered in seventeen days. A second episode starting eight days after discharge and characterized by vomiting, dyspnea, cyanosis, leukocytosis and fever ended in death thirteen days later, following the rapid development of what apparently was congestive heart failure, with rapid enlargement of the liver and pitting edema of the extremities. I think it is fair to say that the heart was probably involved, at least in the last few days. But it is necessary to find another explanation for the previous clinical findings.

On the first admission, there were several things of interest — first of all, the cough and vomiting. I gather that the vomiting soon cleared up following hospital admission, and knowing that vomiting can come from almost anything in an infant, I do not put much stress on that. I think the cough might have had some importance as possibly indicating upper respiratory infection. I shall go into that a little later.

One of the most interesting findings on the first admission was the rather severe anemia, and in an attempt to explain that, it is necessary to consider several possibilities. Was this a nutritional anemia? The statement was made in the record that the diet was adequate, and yet physical examination on admission revealed a child who was rather poorly nourished. Did he have an infection that might possibly account for an anemia of this type? The white-cell count was normal. On admission, the temperature was only slightly elevated, and the smear was normal for a patient of his age. Two common causes of anemia in children on an infectious basis are syphilis and tuberculosis. I think we can rule them out by the negative blood Hinton reaction and the negative tuberculin test. The statement was also made that the throat was congested and filled with mucus. Of course, the mucus may have come from the nose or bronchi. The fact that the patient was coughing suggests that it may have come from the bronchi. Coughing was the commonest symptom and occurred fairly soon after the onset of his illness. I doubt if it would have been possible to make a definite diagnosis of bronchopneumonia or lobar pneumonia in this child, but he might possibly have had an upper respiratory infection, even a bronchitis.

Did the patient have pertussis? Whooping cough is very common at this age. He did not have the characteristic paroxysmal cough of pertussis, and yet it is well known that the clinical course is not necessarily classic in pertussis and may fall in a great many different patterns. The fact that the vomiting followed the cough is slightly suggestive. One thing that might be against the diagnosis of pertussis at this particular stage is the absence of a significantly high leukocytosis. It is well known that pertussis gives one of the highest leukocyte responses of any of the upper respiratory infections in children. Of course, it usually does not appear until the paroxysmal stage, but my understanding of it is that it should be present at the end of the second week at least. When the patient was admitted, he had been sick for three weeks.

Then the question arises, Did he have a primary anemia of infancy? One possibility to be considered is sickle-cell anemia. Nothing is said about the race; although sickle-cell anemia occurs almost always in Negroes, it may be seen in Italians.

Can you clear up that point, Dr. Mallory?

Dr. Tracy B. Mallory: The record simply states that the patient was born in Maine. The name suggests Scottish descent.

Dr. Williams: I do not suppose that rules it out. A few features of the illness suggest sickle-cell anemia, which may occur at this age — six months — and apparently gives a picture similar to this, with a color index of almost 1.0, which this child had. Another thing consistent with sickle-cell anemia is the amount of hemolysis, par-

ticularly at the lower range. Hemolysis was not complete until 0.25 per cent. That is frequently seen in sickle-cell anemia. Also, one may see young red forms in the blood smear, which were present in this case. However, there are a few things against this diagnosis. One is the fact that reticulocytes were not mentioned. Ordinarily, there is a very high reticulocytosis with sickle-cell anemia. Another thing is the fact that, although the spleen is not ordinarily felt in adults, I understand that it is felt in children and infants with this disease. A spleen was not felt in this infant at any time. Another thing against it is the absence of icterus, which was not mentioned either clinically or by a laboratory test. Also, I should think that a complete clearing up of the anemia after the first episode would be against sickle-cell anemia. One thing known about the disease is the fact that these patients are susceptible to intercurrent infection. I think we have rather good evidence of infection in this infant. But I am inclined to discard the diagnosis of sickle-cell anemia, especially since we have nothing definite about the racial origin.

One of the other anemias seen in children is Cooley's anemia. There are several things against that. There is no note about the racial origin — Cooley's anemia usually occurs in Mediterraneans. The spleen is always greatly enlarged, and it was not felt in this case. Bone changes that are usually quite characteristic, especially changes in the skull, are not described. Cooley's anemia is likely to show icterus and a low color index, neither of which was found in this patient. The diagnosis of familial hemolytic jaundice can be thrown out, I think, on the absence of family history, splenic enlargement and jaundice. These patients also show decreased resistance to hemolysis by the fragility test, whereas this patient had increased resistance. Von Jasch's syndrome is another possibility. There is supposed to be high leukocytosis along with anemia, with many immature red cells in the blood stream. On admission, the patient had a low leukocytosis, and the blood counts were normal. Moreover, Von Jasch's syndrome, which is not thought to represent any pathologic entity, is simply a pathologic response. Most of the first episode can be explained, I think, by infection, possibly in the trachea, the bronchi or the interstitial tissues of the lung. At this time, there was no definite indication of cardiac abnormality. Examination of the heart was negative. No murmurs were heard, and there was no cyanosis. It is possible that the anemia at the time of admission might have accounted for the absence of cyanosis. However, when the anemia cleared, no cyanosis was mentioned, and I therefore assume that cyanosis was not present at that time. The patient did have a rapid pulse, — 150, — but in an infant of six months that is not especially exciting. Any slight infection may increase the pulse up that high, so that I think we cannot say very much about the heart.

At the time of the second admission, eight days after discharge, there were several interesting new symptoms. The patient had become dyspneic, something not noticed before, and was definitely cyanotic. This was noticed by the child's mother. At the time of admission, the throat was congested, and there were rales in the lungs. The liver was definitely enlarged. Also, the blood findings were interesting because of the high leukocytosis with only 55 per cent polymorphonuclears. I find that a little hard to explain, but the fact that the next day the white-cell count had subsided to 18,000 with a much higher percentage of polymorphonuclears is a little more comforting and quite consistent with infection. The pulse, which was 160 to 170, was likewise consistent with infection. I think one of the most interesting facts was that, although the physical signs pointed to congestion and possibly consolidation of the lungs, the heart sounds were normal on physical examination, and no murmurs were heard. Ordinarily, with congestion of the lungs on the basis of cardiac failure, the x-ray picture shows cardiac enlargement, and almost invariably a murmur is heard. All this suggests that something in the lung might account for the symptoms and that the heart was not yet involved.

The statement was made in the x-ray report that the heart was normal in size and configuration. The mediastinum was apparently displaced somewhat to the left, but without shift on respiration. At fluoroscopy, there was no definite consolidation. I wonder if the patient could have had bronchopneumonia. Frequently, in bronchopneumonia, the x-ray picture is not too clear cut.

DR. MALLORY: We had the x-ray men review these plates, and they were unable to find any abnormality in the lung fields.

DR. WILLIAMS: There was nothing to account for rales. It has been said that bronchopneumonia of the interstitial type may produce definite signs on physical examination without showing much by x-ray examination. I hope that was so in this case. At any rate, bronchopneumonia in infants is a very common cause of cyanosis, especially if it has been present for some time. I had hoped to explain the cyanosis on the basis of bronchopneumonia.

How can we explain the terminal cardiac failure and possibly the cyanosis, if bronchopneumonia is out? First of all, rheumatic heart disease seems

extremely unlikely at this age, although it may have been reported in infants this young. The electrocardiogram showed a sinoauricular tachycardia, with a rate of 150, and a PR interval of 0.12 second, which is within normal limits for this age and heart rate. I consider rheumatic heart disease not very likely. If the patient had congenital heart disease, I find it difficult to make any single diagnosis. The absence of enlargement by x-ray and murmurs rules out a great many of the congenital heart lesions. I should say that this included primary idiopathic hypertrophy, interauricular septal defects, interventricular septal defects, patent ductus and other conditions. Ordinarily, most of these do not end in death at this early age, unless attended by some complication. I think that covers the group without cyanosis or with primary cyanosis. Then, in the moderate to extremely cyanotic group, I think the tetralogy of Fallot, pulmonary atresia with transposition of the great vessels and other lesions are quite well ruled out by the absence of cyanosis at birth and of significant x-ray findings. However, one congenital defect that should be considered is origin of the left coronary artery from the pulmonary artery, which may give a picture consistent with this patient's story. The characteristics of this condition are freedom from symptoms during early weeks of life, with death usually occurring during the first year, and the prominent symptoms are cyanosis, dyspnea and sometimes chest pain, occasionally a peculiar kind of sweating, in which the infant sweats for no reason. That was seen in this case, but there may have been another reason for it. One thing very much against this diagnosis is the fact that in all the 8 cases in a series reported by White, Bland and Garland* the heart was enlarged for some time before death. That was not true in this patient. Also, in the cases in which an electrocardiogram was obtained, T-wave changes were observed. Nothing was said about the T waves in this electrocardiogram.

DR. PAUL D. WHITE: Let me read the three electrocardiographic reports taken a few days apart, with Dr. Porter's opinions.

> Sinoauricular tachycardia, rate 150; PR interval of 0.12 second; moderate right-axis deviation. The record indicates right ventricular strain, which suggests a congenital lesion or acute ventricular failure.
>
> Sinoauricular tachycardia, rate 155; PR interval of 0.12 second; moderate right-axis deviation; slight inversion of T_3. No significant change from the last record.
>
> Sinoauricular tachycardia, rate 150; moderate right-axis deviation; inverted T_3. No significant change from the last record.

*White, P. D., Bland, E. F., and Garland, J. Congenital anomaly of coronary artery: report of unusual case associated with cardiac hypertrophy. *Am. Heart J.* 8:787-792, 1933.

DR. WILLIAMS: I should think those findings would be against the diagnosis of origin of the left coronary artery from the pulmonary artery, which of course produces myocardial degeneration and hypertrophy, as well as electrocardiographic changes that are diagnostic.

Did this patient have endocarditis? There is nothing to support that diagnosis. The absence of murmurs, petechiae and so forth, as well as the absence — so far as one can tell — of an underlying valvular lesion, would be against it. One other thing that might explain the terminal failure is acute nephritis. It is well known that, in infants and young children, heart failure may follow acute nephritis without hypertension or without nitrogen retention. The one nonprotein nitrogen reported was normal. I presume that was done at the time of admission. It is possible that this patient had nitrogen retention later. Nothing is said about subsequent urines.

DR. MALLORY: A second urinary examination ten days after the first was entirely negative.

DR. WILLIAMS: Was that at the time of the first admission?

DR. MALLORY: At the second admission.

DR. WILLIAMS: That seems to throw out nephritis. Another disturbing point against the diagnosis of nephritis is the fact that there was no anemia during the second admission. Anemia is almost invariably present in acute nephritis in children. I wonder if some pulmonary lesion accounted for the cyanosis and produced secondary polycythemia and thus offset an anemia based on nephritis. Nephritis would also explain the acidosis, which may possibly have been due to a pulmonary lesion, however.

The electrocardiogram is not very much help at this age. One may see right-axis deviation at six months of age in normal infants, but the axis is usually normal at this age.

When I read this over, my final diagnosis was question of bronchopneumonia, possibly following pertussis, with acute nephritis and cardiac failure. The negative urine findings are a bit upsetting, but I do not know how to explain the terminal cardiac failure otherwise because I cannot find, from the data given, any good evidence for a structural change or a congenital lesion that might account for it; accordingly, I shall have to leave it at that.

DR. WHITE: Do you not believe Dr. Porter paid more attention to the possibility of abnormality in the electrocardiogram? As noted in his very first statement, he was apparently impressed by the fact that there was a moderate degree of right-axis deviation, and he said that later records showed

the same deviation. Did it suggest a congenital defect or right ventricular strain beyond what was expected at this age of six months? I think that may be of considerable importance.

DR. WILLIAMS: One thing I wondered was whether, at the time the electrocardiogram was taken, the patient already had enough acute right-sided failure to account for right-axis deviation. I found it very hard to account for on the basis of the usual things, such as pulmonary stenosis, the tetralogy of Fallot and conditions commonly known to produce right-axis deviation. I can see no evidence for acute cor pulmonale on any basis.

DR. WHITE: It is interesting that in the first year of life congenital heart defects cannot be ruled out readily and may be diagnosable only at a later date. I do not know what this youngster had, but the possibility remains that a congenital heart defect was present and did not show up until six months or more after birth, with the delayed appearance of clubbing and cyanosis and with more electrocardiographic right-axis deviation than usual.

DR. WILLIAMS: The clubbing was disturbing. I wondered if it was due to pulmonary involvement, which would also explain the heart failure. When these other things were fitted together, it left the field wide open. If there were a tetralogy of Fallot, it should give changes by x-ray examination. Could the terminal cyanosis have been due to auricular septal defect? One would then have a better explanation for the electrocardiogram without having to relate it to immediate strain and failure from other cause. Can one make a diagnosis of the tetralogy of Fallot in the absence of murmurs?

DR. WHITE: I think so, although I should hesitate, as in this case, to make the diagnosis of a structural cardiac defect during the first year of life without more proof, although such a condition should be considered possible.

DR. MARGARET M. GLENDY: There was one clinically interesting observation not brought out in the abstract. The child was admitted on Saturday afternoon. On Sunday morning, there were fine rales in the lungs, and the liver was only 3 cm. down. On Monday, it was down to the crest of the ilium. The cyanosis was present from the time of admission until death.

DR. WILLIAMS: I thought the rapid liver enlargement ought to be explained by progressive right-sided heart failure, but again the field is wide open.

DR. WHITE: There is only one x-ray report. The heart shadow might have become greatly enlarged before death and might have changed significantly, as with the development of a pericardial effusion that might have caused a terminal tamponade.

DR. MALLORY: Dr. Edward F. Bland saw this case in consultation and made the following note:

> I agree with the observations of others. Today, the patient is slightly cyanotic even in the oxygen tent. I hear no murmurs or gallop. In view of the cyanosis, the right-axis deviation and the globular-shaped heart by x-ray, I think he has congenital heart disease — probably a combination of defects, with patency of the septum (auricular) and possibly of the ductus as most likely. The prognosis is probably unfavorable.

He was at least correct in the last statement.

CLINICAL DIAGNOSES

Congenital heart disease.
Cardiac failure.

DR. WILLIAMS'S DIAGNOSES

Cardiac failure, right-sided.
Bronchopneumonia.
Acute nephritis.

ANATOMICAL DIAGNOSES

Congenital alveolar atelectasis.
Pulmonary arteriolar hypertrophy.
Cor pulmonale.
Chronic passive congestion of systemic circulation.

PATHOLOGICAL DISCUSSION

DR. MALLORY: Post-mortem examination showed a somewhat enlarged heart, with marked hypertrophy of the right ventricle. The right ventricle measured 5 mm. in thickness, which, even in an adult, is probable evidence of cor pulmonale. In an infant, it is an extreme degree. The left ventricle measured 6 mm. The lungs at the time of autopsy seemed reasonably well distended and aerated, although they were just a little subcrepitant. They were not edematous. It was obvious that there was cor pulmonale, for which there was no gross anatomical explanation.

On microscopic examination of the lungs, two things were obvious. The small pulmonary arteries were considerably thicker than normal. In fact, they looked like systemic, not like pulmonary, vessels. This thickening was due to true hypertrophy, primarily of the muscular layer of the wall. There was no endarteritis and no evidence of narrowing of the lumens, so that one must assume that pulmonary hypertension existed without primary vascular disease to explain it. Dr. Ronald C. Sniffen studied these vessels with

considerable care, measuring their internal and external diameters and calculating their ratios. The results from this case, from a similar one in another infant and from those of two control patients of the same age appear in Table 1. Three

TABLE 1. *Ratios of External Diameter to Lumen Diameter.*

CASE	EXTERNAL DIAMETER OF VESSELS		
	600–1200μ	450–550μ	200–400μ
Present case	1.8	2.5	2.4
Similar case	1.8	3.3	2.1
Control 1	1.3	1.4	1.5
Control 2	1.2	1.3	1.5

ranges of arterial size were studied in each case. The greatly increased thickness of the arterial walls, particularly in the smaller sizes of arterioles, is clearly brought out.

The lung parenchyma proved interesting in that there were practically no expanded alveoli and yet grossly the lung was not atelectatic. All the alveolar ducts and small bronchioles were grossly overexpanded so that the total amount of air in the alveoli was not much below normal. That is a very unusual form of atelectasis. It was uniform in all parts of all lobes. Ordinarily, with atelectasis, the alveolar ducts are collapsed, as well as the alveoli in the areas involved. Here the ducts were everywhere overdistended. In the collapsed alveoli, there were many accumulations of desquamated septal cells, which looked as if they had been present for a long time—I know of no way of estimating how long, but I am quite sure for longer than the duration of the final illness. It seems to me not impossible that this may even have gone back to birth and the patient had lived all these months ventilating only with his respiratory bronchioles. In any child dying a few days after birth, it is not uncommon to find large areas of lung tissue in which the alveoli have not expanded, and yet these lungs will transilluminate by x-ray in normal fashion.

DR. WHITE: Is that the cause of death in these cases?

DR. MALLORY: No; it is not. These children are not cyanotic, since some time can elapse before the child needs all his lung tissue to keep the blood oxygenized. The pediatricians may dispute this point, but I think Dr. Sidney Farber would agree. I have seen one other case, which is identical, in a child of approximately the same age, but unfortunately, the clinical history was inadequate. It showed the same hypertrophy of all the pulmonary arteries and the same failure of expansion of alveoli, and I am strongly tempted to tie the two together. I think that the lack of expansion of alveoli is in some way responsible for pulmonary hypertension and that the arterial changes are secondary. Dr. Williams's suspicion that the cardiac picture was in some way secondary to the pulmonary lesions is entirely correct.

DR. WHITE: Has this clinical entity or syndrome been described yet, and are you going to put these two cases together?

DR. MALLORY: I wish I knew more about the other case. We had only the heart and lungs, without any clinical findings to go with them.

DR. WHITE: Was there any evidence of infection in this case?

DR. MALLORY: No; we did find, in the myocardium, a few foci of lymphocytes. I suppose one could speak of myocarditis, although not enough to be of importance. I am sure there was no rheumatic fever.

DR. WHITE: Was there acute right ventricular failure?

DR. MALLORY: Yes.

CASE 28402

PRESENTATION OF CASE

A fifty-nine-year-old Irish-American unemployed man was admitted to the hospital because of pain in the lower abdomen and flanks.

Five months before entry, the patient was operated on in a community hospital for repair of bilateral inguinal hernias. He was discharged after an uneventful postoperative course of twenty-one days. After this, he experienced almost constant soreness and tenderness in the lower abdomen and flanks. He also had sufficient headache to keep him awake at night. About three months before entry, he had an attack of fever, for which his physician put him to bed for a week, with a special diet. The soreness and tenderness in the abdomen and flanks persisted. About a month later, a long dark blood clot was passed in the urine. Subsequently, several similar clots were passed. There were no other urinary complaints, and only occasional nocturia. There was a loss of about 18 pounds of weight during the illness.

The patient admitted the use of much beer and wine. The past history was otherwise irrelevant.

On admission, the patient appeared pale and thin. The tongue was beefy red and dry. The lungs seemed emphysematous. The heart was slightly enlarged to the left, with a moderately loud systolic murmur at the apex. Bilateral scars of recent herniorrhaphies were present. Both kidneys were palpable; the right was ballotable and down four to six fingerbreadths below the costal margin, whereas the left was down about one fingerbreadth. The costovertebral angles were

tender. The prostate felt firm and rubbery, and was of normal size. There was slight hypospadias of the glans.

The blood pressure was 140 systolic, 80 diastolic. The temperature, pulse and respirations were normal.

Examination of the blood showed a red-cell count of 3,900,000 with 75 per cent hemoglobin, and a white-cell count of 14,500 with 76 per cent polymorphonuclears. The blood Hinton reaction was negative. The urine showed a specific gravity of 1.012, a +++ test for albumin, and many red cells and a few white cells in the sediment. The urine culture showed abundant growth of colon bacilli. The blood nonprotein nitrogen was 30 mg. per 100 cc.; the chloride was 97.5 milliequiv., and the bicarbonate 25.2 milliequiv. per liter; and the serum protein was 6.7 gm., the calcium 10.3 mg. and the phosphorus 7.0 mg. per 100 cc.

A roentgenogram of the chest showed multiple adhesions of the diaphragm and thickening of the pleura on the left side. The heart was slightly enlarged in the region of the left ventricle, and the aorta was tortuous, elongated and calcified. A flat film of the abdomen showed a clear psoas shadow on the right, and diminution in visibility of the shadow on the left. The right kidney shadow was obscured.

An intravenous pyelogram, taken in the Out Patient Department shortly before admission to the hospital, showed the right kidney outline to be indistinct and unusually large. The left was slightly larger than usual but of normal shape. An area of calcification overlay the upper pole of each kidney, consistent with costal cartilage. The left kidney showed normal excretion of dye and normal contour. The bladder appeared small. Both sacroiliac joints were fused.

On the day after admission, retrograde pyelography was attempted, without success. A roentgenogram showed the catheters to have extended to both renal pelves. The shadow of the right kidney seemed large.

Following cystoscopy and ureteral catheterization, the patient remained anuric for about twenty hours. The blood nonprotein nitrogen rose to 67 mg. per 100 cc. The temperature spiked to 103°F. for a few days, and then varied from 98 to 100°F. for the next two weeks. Urine gradually reappeared, but the output remained low. The urine was not bloody. There were occasional vomiting and nosebleeds. A blood culture grew colon bacilli in both flasks. For the first five days, the patient was given a daily intravenous infusion of 1500 cc. of 10 per cent glucose in physiologic saline solution.

The patient failed to improve. Although the urinary output increased satisfactorily, the nonprotein nitrogen of the blood rose to 158 mg. per 100 cc., and the chloride to 113 milliequiv. per liter; the bicarbonate fell to 17.0 milliequiv. per liter, and the protein to 5.1 gm. per 100 cc. The patient was therefore transfused in an attempt to raise the serum protein and improve kidney function. On the twenty-third hospital day, the temperature again began to spike, reaching 105°F. In the next week, the patient continued to do poorly. He complained of chest pain and was intermittently irrational. Slight dependent edema appeared. The urinary output continued fair, and the blood nonprotein nitrogen dropped to 97 mg. per 100 cc. Terminally, rales were heard in the chest, and Cheyne-Stokes respirations set in. Death occurred on the twenty-seventh hospital day.

Differential Diagnosis

Dr. J. Dellinger Barney: "Both kidneys were palpable; the right was ballotable and down four to six fingerbreadths below the costal margin." That may mean they were palpable because they were large or merely that they were low.

The tender costovertebral angles indicate an infectious process in or around the kidneys.

The blood studies show a certain degree of secondary anemia, and a moderate leukocytosis.

One would have to think of the possibility of nephritis or a polycystic kidney, and of tuberculous kidney or a bilateral tuberculosis. Tuberculosis can perhaps be excluded, because we generally get a sterile urine with tuberculosis. In this case, there were colon bacilli in the urine, and no instruments had been passed, so that there was no chance for external infection.

The very high phosphorus suggests uremia.

The right kidney shadow was obscured but apparently large on each of several examinations. I should like to know if the outline, so far as it could be seen, was regular or had lobules suggesting cysts, multiple or solitary, or neoplasm. We know more about the left kidney from the record than we do about the right. The left kidney showed normal excretion of dye and normal contour. Nothing is said about the right side.

Dr. Tracy B. Mallory: I think it is safe to assume that there was no excretion on the right side.

Dr. Barney: If they succeeded in getting the catheters up to the renal pelves, I should like to know why they were unsuccessful in injecting dye into them.

From the story, one can safely say that the patient had a cystoscope reaction, which is not very common but does occur. Although, under certain

conditions, such a reaction might be considered unavoidable, we must remember that at least one pathologic kidney was present.

I do not know that I can explain the nosebleeds, but the vomiting may have been due to renal insufficiency. The high blood phosphorus and the rising nonprotein nitrogen are confirmatory evidence. The patient had a colon-bacillus bloodstream infection, which might well have resulted from a primary renal infection. Intravenous infusion of glucose was given in an effort to overcome this infection and the anuria by re-establishing the proper excretion of urine. Nevertheless, the nonprotein nitrogen climbed to 158 mg. per 100 cc., indicating that the process in the kidney was definitely worse.

So far as the final episode is concerned, one must think of pneumonia, infarct of the lung and, possibly, pulmonary embolism.

Without going into all the details of this case, it seems to me that this man was well until after the hernias were repaired. He then began to get into trouble. We do not know about the past history. Apparently, it was irrelevant. The patient had not had this trouble before. When he came into the hospital, it was found for the first time that he had certainly low and certainly enlarged kidneys. The costovertebral angles on each side were tender, and there was some infection, as shown by a certain amount of pus in the urine and the growth of colon bacilli from the urine. I should say that this kidney process involved particularly the right side, was of long standing and, after the hernia operation, flared up. The patient was cystoscoped, catheterized and so on, which made the matter still worse, and the kidney function fell off quite markedly. The infection in the kidneys continued, however, and he developed generalized colon-bacillus infection.

The question is, What process would involve both kidneys and give a picture like this? We must consider a variety of things, particularly bilateral polycystic kidneys, in spite of the pyelogram. On one side, there was apparently normal excretion, and on the right side, — with the larger kidney, — there was no excretion of dye at all. I think polycystic kidney is not incompatible with the finding of a nonprotein nitrogen of 30 mg. per 100 cc. when the patient first came in. The left kidney might be doing enough work to compensate for the right kidney to a large extent, but not entirely. On the other hand, polycystic kidneys in a man of this age — fifty-nine — are unusual. Such patients often die earlier, and they generally have a previous history of hematuria, pain and infection. But that would account for a good deal of the picture. Again, this may have been a simple cyst, but I do not believe such a cyst would put one kidney out of action.

Tumor must be considered. Again, new growth involving both kidneys is extremely rare. Tuberculosis, I think, can be ruled out because of the lack of symptoms, although there was evidence of old trouble in the chest, but not the symptoms one usually sees with renal tuberculosis, such as bladder irritability, and colon-bacillus infection is unusual with tuberculosis.

We must also consider pyonephrosis, with extensively damaged and infected kidneys. I think that there would have been a great deal more pus in the urine with such a condition and that, during some time before cystoscopy was performed, the patient would have had a higher temperature and more pain than is recorded. The possibility of lymphoma must not be forgotten. It might, in some bizarre way, involve both kidneys and perhaps give the picture that we have.

It is difficult to evaluate all the symptoms and put them together, but my first diagnosis is polycystic congenital kidneys.

Dr. Mallory: Would you like to see the x-ray films before you commit yourself?

Dr. Laurence L. Robbins: This simply shows the large right kidney; the left kidney, so far as I can determine, is normal in size and shape and excretes the dye normally.

Dr. Barney: The left kidney may, as you say, excrete the dye normally so far as it excretes it, but there is very little dye. There is no evidence whatever of pelvis or calyxes on the right side. I believe that the kidney was extensively damaged. On that basis alone, it seems to me that a polycystic kidney can almost be ruled out. I think one can also rule out the possibility of tuberculosis, as well as nephrosis and pyonephrosis.

I cannot say anything better than polycystic kidney.

Dr. William B. Breed: You ruled out everything, did you not, Dr. Barney?

Dr. Barney: Nearly.

Dr. William C. Quinby: I should like to know why they could not make a pyelogram. They put the catheter high up. The point is just here, gentlemen: the outstanding assets of the urologist's diagnostic armamentarium are the cystoscope and the ability to make pyelograms by injecting opaque fluid through a ureteral catheter; if one does not do it and if one cannot give a reason why it was not done, the whole discussion is reduced

to a guessing match because no one would try to make a diagnosis without that evidence.

DR. MALLORY: I think, Dr. Quinby, that is merely putting the genitourinary surgeon on a par with the medical man. It is only fair once in a while to ask him to guess too, because the medical man is rarely able to visualize the pathologic lesions that he must diagnose.

DR. QUINBY: True enough, but if there is a direct way of making a pyelogram, why not do it? A medical man is not expected to make a diagnosis of cardiac lesions without an electrocardiogram.

DR. BREED: Is there some explanatory note, or is the person here who did the cystoscopy?

DR. MALLORY: No; but I assume that the patient was quite ill and, possibly, had some sort of reaction on the table, and they believed they could not continue.

DR. BARNEY: The retrograde pyelogram was unsuccessful. That is all we have to go by in the record.

CLINICAL DIAGNOSES

Bilateral pyelonephritis.
Pyonephrosis?
Uremia.
Bronchopneumonia.
Coronary heart disease.
Renal tumor?

DR. BARNEY'S DIAGNOSIS

Polycystic kidneys.

ANATOMICAL DIAGNOSES

Renal-cell carcinoma (hypernephroma type) of right kidney, with extension along renal vein into vena cava and with metastases to splenic vein.
Pyelonephritis, acute and chronic, left kidney.
Bacterial endocarditis, colon bacillus, aortic valve.
Cerebral infarct, septic.
Pleuritis, chronic fibrous, bilateral.
Operative scars: herniorrhaphy, bilateral.

PATHOLOGICAL DISCUSSION

DR. MALLORY: At autopsy, we found an extremely large kidney on the right, which was filled with tumor, a characteristic hypernephroma. In typical fashion, the tumor had grown up the renal vein, and a plug of tumor tissue protruded into the vena cava for a distance of 3 cm. This tumor thrombus in the cava was not large enough to cause obstruction, although, occasionally, real caval obstruction is produced in this way. An unusual and unexpected finding was a solitary metastasis in the splenic vein, which was completely occluded by the tumor. The other kidney showed a fairly severe pyelonephritis.

There was also a terminal bacterial endocarditis due to colon bacillus, — it will be recalled that the blood culture was positive, — and an embolus from the vegetation on the aortic valve had produced a small area of softening in the brain. There were old pleuritis and healed tuberculosis of the lungs, but no pulmonary metastates.

The New England
Journal of Medicine

Formerly
The Boston Medical and Surgical Journal
Established in 1828

Owned by the Massachusetts Medical Society and Published under the Jurisdiction of the Committee on Publications

Official Organ of
The Massachusetts Medical Society
and
The New Hampshire Medical Society

Editorial Board

Joseph Garland, M.D. — Stephen Rushmore, M.D.
George R. Minot, M.D. — Henry R. Viets, M.D.
Frank H. Lahey, M.D. — Robert M. Green, M.D.
Shields Warren, M.D. — Charles C. Lund, M.D.
George L. Tobey, Jr., M.D. — John F. Fulton, M.D.
C. Guy Lane, M.D. — A. Warren Stearns, M.D.
William A. Rogers, M.D. — Dwight O'Hara, M.D.
Chester S. Keefer, M.D.

Associate Editors

Thomas H. Lanman, M.D. — Donald Munro, M.D.
Henry Jackson, Jr., M.D.

Walter P. Bowers, M.D., Editor Emeritus
Robert N. Nye, M.D., Managing Editor
Clara D. Davies, Assistant Editor

Subscription Terms: $6.00 per year in advance, postage paid, for the United States (medical students, $3.50 per year); Canada, $7.04 per year, Boston funds; $8.52 per year for all foreign countries belonging to the Postal Union.

Material for early publication should be received not later than noon on Friday.

The Journal does not hold itself responsible for statements made by any contributor.

Communications should be addressed to the *New England Journal of Medicine*, 8 Fenway, Boston, Massachusetts.

INSTRUCTION IN INDUSTRIAL MEDICINE

The joint announcement of the Committees on Postgraduate Instruction and Industrial Health of the Massachusetts Medical Society in this issue of the *Journal* is a local expression of the widespread and growing consciousness of the importance of health in industry. This is not entirely a medical awakening. While the medical profession, whose general interest has always been the preservation of health, is striving to orient itself, the industrialists, whose primary interest has heretofore been costs, production and quality of output, are likewise showing an appreciation of the potential value of a physiologically sound employee.

Evidence of the interest of Massachusetts manufacturers is found in the current issue of *Industry*, the official organ of the Associated Industries of Massachusetts, where a series of twelve excellent and appropriate articles dealing with the health of workers is appearing. It is a safe prediction that before the passage of another year more than one physician in Massachusetts will be asked by an employer or personnel officer to give an opinion or discuss a problem that was suggested by one of this series of articles. The progressive physician should prepare himself.

Throughout the United States, the vital significance of industrial medicine has been recognized. Iowa has organized and presented an institute on industrial health; at Yale University, a series of ten weekly exercises will be given this fall; in Brooklyn, an intensive two-week course has been announced, and so it goes. Alive and alert to all this, the Council on Industrial Health of the American Medical Association is keeping abreast, and serving in a particularly useful way by disseminating information from one part of the Nation to another.

The announcement referred to above asks that interested physicians mark November 7 on their calendars. Every doctor who is called into the manufacturing plants of his locality — especially into the smaller plants, and even though he is called but rarely — is an "interested physician," and the role he plays may be exceedingly vital. It is now plain that the war is to be won or lost by a narrow margin, and this is a critical period in the battle of production.

LEGAL ASPECTS OF FIRST AID

A letter[1] in a recent issue of the *Journal* called attention to a situation that needs to be clarified: Will the lay persons who administer first aid run the risk of becoming defendants in lawsuits brought by dissatisfied victims of bombing or other disaster? No specific legislation has yet been passed, and any opinion advanced must be accepted

for what it is worth — that is, as a mere expression of belief regarding what the probable outcome of such lawsuits would be.

In the first place, it should be pointed out that those who administer first aid are liable to litigation, since "any aggrieved person, with or without cause, can file an action at law."[2] The validity of the suits will be decided by courts of law. Until the merits of such claims in the imminent, unprecedented circumstances have been assessed by the courts, it is reasonable to assume that the principles involved would be analogous to those in suits for malpractice brought against physicians.

A recent study[3] of the problem poses several questions and attempts to give answers, which are admittedly not applicable universally. The first-aid worker would be reasonably protected if he followed rules accepted by the American Red Cross and the civilian-defense groups throughout the Nation. The necessary skill and precaution are defined as "such care as a reasonably prudent person should exercise, considering all the circumstances such as the injury itself, the entire situation of the emergency, [and] the training of the first aider." The authors' statement that those trained in first aid are probably under a legal duty to render such care seems unwarranted in view of the following statement by a recognized legal authority[4]: "No duty rests on a physician to accept an employment. He may refuse arbitrarily to engage his services." If a physician is not required by law to treat a patient, how can a different rule be applied to a first-aid worker?

Presumably, the layman trained in first aid has no more responsibility and is entitled to no less protection than the physician. Accordingly, the defense of the latter against litigation should apply equally to the former. And the specialist in legal medicine referred to above has this to say concerning the results of treatment, "A physician is not a guarantor either of his diagnosis or of his treatment, and the required negligence necessary for his liability is not made out by mere evidence of results of treatment or a failure to cure or a disappointing result."

Although it must again be emphasized that the layman's risk cannot be specifically assessed at present, it is apparent that anyone who follows conscientiously the accepted routine of first-aid treatment is in little danger of being successfully sued by the aggrieved recipient of his ministrations. Laws are passed to deal with situations that arise, and court decisions are based on the law, on precedent and on the human factors involved. Those who attempt to relieve suffering and save lives should have no fear that justice will tolerate unwarranted claims against them. Nevertheless, there is urgent need for statutes defining the rights and duties of civil-defense workers. These should be put into effect now — before the evil emergency is upon us.

References

1. Correspondence. Wells, C. E. Legal aspects of first aid. *New Eng. J. Med.* 227:236, 1942.
2. Smith, H. W. Legal responsibility for medical malpractice. VI. Further information about direct causation and damage. *J. A. M. A.* 117:23-33, 1941.
3. Potthoff, C. J., and Carroll, P. Legal aspects of first aid by lay people. *Minnesota Med.* 25:448-451, 1942.
4. Smith, H. W. Legal responsibility for medical malpractice. V. Further information about duty and dereliction. *J. A. M. A.* 116:2755-2768, 1941.

MEDICAL EPONYM

Roentgen Ray

The discovery of the x-ray was announced at a meeting of the Physico-Medical Society in Würzburg in 1895. The paper by Wilhelm Conrad Roentgen (1845–1923), "Über eine neue Art von Strahlen (On a New Kind of Rays)," appeared in the *Sitzungsberichten der Würzburger physikalisch-medizinischen Gesellschaft* (1895, pp. 132–141). A portion of the translation follows:

> If in a completely darkened room, one allows the discharges from a large Ruhmkorff coil to pass through a Hittorf vacuum tube (or a sufficiently evacuated Lenard's, Crookes's or other similar apparatus) and covers the tube with a rather closely fitting jacket made of thin black cardboard, a paper screen which has been painted with barium platinum cyanide will be seen to glow brightly and become fluorescent when brought near the apparatus. It makes no difference whether the painted or the unpainted side of the screen is turned toward the source of the discharge. . . . In the presence of this phenomenon one is first struck by the fact that some agent is passing through the black cardboard jacket — a jacket which will not allow the passage of either the visible or ultra-violet rays of the sun or the rays of an electric arc light; further, that this agent is able to generate a marked fluorescence. . . . It will be found that all bodies

are permeable to this agent, but in very different degrees. . . . Paper is very permeable. . . . Thick blocks of wood are also permeable. . . . Sheets of hard rubber several centimeters in thickness still permit the rays* to pass through. . . .

*For the sake of conciseness, I should like to use the expression "rays," and to distinguish them from others, the name "x-rays."

R. W. B.

MASSACHUSETTS MEDICAL SOCIETY

AMERICAN MEDICAL ASSOCIATION

After prolonged and intensive consideration, the Board of Trustees of the American Medical Association has come to the conclusion that the annual session of the association scheduled to be held in San Francisco in 1943 should be canceled. An official meeting of the House of Delegates will be held in Chicago at a time to be announced.

COMMITTEES ON POSTGRADUATE INSTRUCTION AND INDUSTRIAL HEALTH

On August 17, the Committee on Industrial Health voted to hold a comprehensive one-day program on industrial medicine, to be organized with the interests of general practitioners and part-time industrial physicians in mind, and to be held, if possible, in co-operation with the Committee on Postgraduate Instruction. The two committees met in joint session on September 2, and are now collaborating on a program to be held on Saturday, November 7, morning, afternoon and evening, at the Harvard Club of Boston. The subjects to be discussed, the speakers and the dining and registration arrangements will be announced within a few weeks. Interested physicians are asked to mark the date on their calendars.

REGINALD FITZ, *Chairman*
Committee on Postgraduate Instruction
DWIGHT O'HARA, *Chairman*
Committee on Industrial Health

COMMITTEE ON MATERNAL WELFARE*

CASE HISTORY: POST-PARTUM HEMORRHAGE, FOLLOWED BY CEREBRAL HEMORRHAGE AND DEATH

A thirty-five-year-old primipara at term had been seen routinely during a normal pregnancy. The past history was entirely irrelevant. She was delivered by low forceps, labor consuming eight hours and being complicated in no way. The placenta was delivered spontaneously, and there was no hemorrhage. The blood pressure during labor was 90 systolic, 60 diastolic. The day following delivery, the patient developed a severe headache, and the blood pressure rose to 160 systolic, 90 diastolic. There was no note of convulsions. Hemiplegia developed soon after the onset of the headache, and death occurred three days later. Autopsy showed cerebral hemorrhage (basal ganglion and right internal capsule), subacute nephritis and fatty degeneration of the liver.

Comment. It is fortunate that an autopsy was performed, for the subacute nephritis and fatty degeneration of the liver are suggestive of a fulminating toxemia post partum as the basic cause of death. From the headache and increased blood pressure one might have inferred that an unusual post-partum toxemia was responsible, but without the autopsy, the clinical diagnosis of cerebral hemorrhage would probably have been made. The value of the autopsy in this case illustrates how helpful it would be if autopsies were more frequently performed.

*Beginning with the October 15 issue of the *Journal*, a résumé of the maternal mortality in Massachusetts for the year 1941 will appear. It is planned to present an exhaustive analysis of this investigation, an article to be published each week for some time.

WAR ACTIVITIES

CIVILIAN DEFENSE

At a meeting of various members of the Medical Division, Massachusetts Committee on Public Safety, held at the Parker House, Boston, on August 26, the following matters were emphasized by Dr. A. William Reggio, the medical director:

1. Changes have been advised regarding the setup of medical first-aid posts so that they may function more easily in conjunction with local conditions. It is suggested that the number of first-aid posts in all communities be divided into first-line active and second-line reserve posts, that is, one half on the active list and the other half on the reserve list, because of the increasing shortage of physicians. It is also believed that if half the number of posts are active, well drilled, and completely manned and equipped, they can cope with almost any situation that may arise. This in no way should upset the present setup or disturb the work that has been done. It is merely a way of improving the setups and of somewhat lessening the strain on each community. It is also suggested that members of the dental profession be used more in these mobile posts, and in those communities where there are well-trained veterinarians that they could also be utilized, with a little instruction. Practice sessions for these first-line mobile posts are urgently recommended. In this way, it is also believed that a spirit of competition will arise as a result of which the second-line reserve posts will feel a greater incentive to graduate from the reserve to the active list.

2. In those communities where emergency hospitals are established, at least one first-aid post must operate from such a hospital. This in no way should upset the present setup in any community. It is merely an ad-

junct to the already existing posts and is a requirement laid down by the United States Office of Civilian Defense in Washington.

3. Before long, the regional medical heads will receive a number of certificates to be given to all members of the Medical Division already enrolled in the Massachusetts Committee on Public Safety. These certificates show evidence of the fact that the holder has been enrolled as a member of the United States Citizens' Defense Corps. The holding of such a certificate by each member is essential. The reason is that government supplies are now being allocated and will be distributed only to those communities in which every member of the Medical Division has been so enrolled. This in no way changes the status or allegiance to the state organization but is merely additional evidence of the fact that all members are also enrolled in the United States Citizens' Defense Corps as the second line to the Army and Navy.

4. The question of nonmedical deputies being appointed to sit and function in the report centers in some localities has been raised. It seems advisable to plan on this, owing again to the increasing scarcity of physicians. If such a nonmedical deputy is appointed, it is essential that the medical director's office be notified of his name, address and telephone number.

5. Since the Massachusetts terminology of medical setups differs somewhat from that used in the Office of Civilian Defense, a listing of the equivalent terms should help to avoid confusion in future communications. These are as follows:

Massachusetts	Office of Civilian Defense
Report center	Control center
Base hospital	Emergency base hospital
Emergency hospital	Casualty receiving hospital
Medical first-aid post	Mobile medical or Emergency Medical Service teams (2)
Stretcher bearers	Stretcher teams
First-aid party	First-aid squad
Chief medical officer	Local chief of Emergency Medical Service

CORRESPONDENCE

DEPRIVATION OF LICENSES

To the Editor: At a meeting of the Board of Registration in Medicine held September 16, the Board voted to suspend the license of Dr. Leo Leinwald, 1218 Commonwealth Avenue, Boston, because of gross professional misconduct in the practice of his profession as shown by false evidence in a court case.

H. Quimby Gallupe, M.D., *Secretary*
Board of Registration in Medicine

State House
Boston

To the Editor: At a meeting of the Board of Registration in Medicine held September 16, the Board voted to find Dr. Zarch, 32 Prospect Street, Bridgewater, guilty of deceit in filing his application for the examination in November, 1941, and voted that his license to practice medicine in the Commonwealth be revoked and action suspended.

H. Quimby Gallupe, M.D., *Secretary*
Board of Registration in Medicine

State House
Boston

REPORTS OF MEETINGS

BOSTON CITY HOSPITAL

The fourth in the series of lectures on war medicine, sponsored by the Boston City Hospital House Officers' Association, was held at the hospital on May 14.

Dr. Maxwell Finland discussed "Communicable Respiratory Diseases in Wartime." It was emphasized that the streptococcus, although the commonest offender of the group, owes its importance largely to complications of the original infection. This has become especially true since the widespread use of the sulfonamide compounds.

Since World War I, but more especially in the early stages of the present war, many advances have been made in the understanding of these complications. The most significant observation is that the secondary invaders are usually a different type of streptococcus, especially in complications that occur later than ten days. They are really cross-infections, and should be so treated. Otitis media is still the commonest sequela. Prevention may be attempted by proper segregation according to types of organism, but even this is not entirely satisfactory.

The question always arises, When may scarlet fever be said to exist or to be epidemic? All the Group A streptococci are toxigenic to some extent, and whether a person will have the signs of tonsillitis or scarlet fever depends on the balance between the virulence of the organism and the resistance of the host. Therefore, there is always some scarlatina during streptococcal epidemics, and the same type of organism has been identified in the two kinds of manifestations of the same epidemic. The fact that the organisms causing the current cases of scarlet fever are of low toxicity will probably lead to more recurrences, for the formation of antibodies in such cases is poor. Such patients may remain positive to the Dick test and may fall prey to even slightly more potent streptococci. Recurrences have been reported in as high as 8 per cent of some epidemics.

Rheumatic fever is becoming more generally recognized as a definite sequela of streptococcal infections. But it is necessary to have a susceptible host and a certain unknown characteristic of the organisms to activate the process. Family background apparently plays a role. The incidence of complications in rheumatic fever is higher than physicians generally realize, especially if one observes the patient over a sufficiently long period with adequate tests.

Measles is the next most important communicable disease in army camps, largely because this supposedly innocuous exanthematous condition becomes more serious in such congregations of conglomerate groups of men. Epidemics occur invariably after a large influx of new men who are tired from the rigorous new life and are largely or partly from rural districts where measles has not been encountered. The seriousness of such epidemics is proportional to the number and severity of secondary infections. The streptococcus, which is the commonest secondary invader, attacks a respiratory tract whose entire length has been prepared by the preceding virus. Serious streptococcal pneumonias may be aborted by the proper use of chemotherapy, which should check the spread of virulent streptococci both in the individual respiratory tract and from person to person.

Influenza, it has been demonstrated, may be widespread without much disability or mortality, but a second wave, with its fearful secondary pneumonias, may be catastrophic. If the secondary invader is the pneumococcus, the prognosis is that of any well-treated lobar pneumonia, and the disease should not be serious since the ad-

vent of chemotherapy and the improvements in specific antiserum. In infections with the hemolytic streptococcus, which is the complicating organism following throat or measles epidemics, the prognosis is not so favorable, even with the sulfonamide drugs. But by far the most terrifying prospect is the widespread pulmonary necrosis that follows staphylococcal invasion and gives every indication of being not only more prevalent but less amenable to even the best forms of chemotherapy.

Lobar pneumonia is the most hopeful of all the communicable respiratory diseases since the advance of chemotherapy and serotherapy. The new fad of calling atypical cases "virus pneumonias" is deprecated. Certain viruses are known to produce such pneumonitis, particularly psittacosis and influenza, but the last is the only common one. Most cases of influenza are now considered to be due to virus, since comparable syndromes are observed in the ferret, with widespread pathologic changes and no bacteria. By proper culture methods, *Haemophilus influenzae* can be demonstrated in the respiratory tracts of most people who are well or suffering from mild upper respiratory infections. Therefore, this is very likely only a secondary invader.

The prevention of communicable respiratory diseases is still largely an unsolved problem. The gradual exposure of groups rather than sudden exposure of whole camps does not appear practical in the sudden expansion program. Proper spacing in barracks and hospitals and the placing of beds with alternate heads reversed increase the necessary distance for bacteria to travel and materially alter the incidence of infection. The most valuable and difficult task is to decrease the carrier rate. Although previous sprays have not seemed effective, a new gramacidin spray compound appears promising. The early general use of sulfonamide drugs may prove an abortive power, at least in streptococcal spread. Wholesale inoculation with the specific pneumoccocal carbohydrate may be effective if such an epidemic is being caused by one type. Probably the most important group to attack is the medical personnel, who are apt to be careless. Vacations during respiratory infections should be advocated or, if that is not possible, special masking and careful hygiene and precautions. The importance of dust is ever increasing. A fine oil spray may prevent easy spread, and various germicides sprayed around during bedmakings have met with indifferent success. The use of ultraviolet light as a barrier between beds shows promise for airborne infection only. Eating utensils are a prime source of cross-infection unless properly cleaned, and such cleaning includes running hot water when possible.

The definitive treatment of this group of infections is practically the early and adequate use of the sulfonamide compounds and other drugs. For the intelligent and successful therapy of any infection, the responsible bacterium must be specifically identified. Whereas the pneumococcal pneumonias require only three or four days of intensive therapy, a streptococcal pneumonia with fluid may require one or two weeks or longer. In general, sulfadiazine is the most effective drug, largely because of its greater bacteriostatic effect, but also because of its considerably lesser toxicity, which permits more intensive and prolonged therapy.

The consequence of cross-infections even in supposedly "clean" hospital wards was demonstrated by the development of pneumonias from a different type of pneumococcus in patients convalescing from an original one. In other places, as high as 25 to 35 per cent of patients in "clean" wards developed positive streptococcal cultures in their throats, especially during the second and third weeks of convalescence.

BOSTON ORTHOPEDIC CLUB

The annual spring clinic and meeting of the Boston Orthopedic Club was held on May 18, with Dr. Otto J. Hermann presiding. The afternoon clinic on various aspects of surgery of the hand was held at the Boston City Hospital.

The first paper, delivered by Dr. J. Edward Flynn, of the Boston City Hospital, discussed "Dissections of the Fascial Spaces of the Hand." It was concluded from careful examination of over a hundred dissected hands post mortem that there are always clearly defined midpalmar and thenar spaces. In no case was there absence of the dividing septum. In discussing this paper, Dr. Sterling Bunnell, of San Francisco, the guest of honor, pointed out that this accurate investigation completely settles any previous conflicts in the anatomy of the fascial spaces. In Dupuytren's contractures, this septum demonstrated by Dr. Flynn is greatly accentuated.

The second presentation, by Dr. Edward Hamlin, Jr., of the Massachusetts General Hospital, was entitled "The Innervation of the Hand." His conclusions were based on end results from a group of cases at that hospital, in which the outcome was considered "good" if the patient was able to resume his usual occupation or carry on everyday life satisfactorily. In 147 cases, involving the repair of all nerves, about 80 per cent were in this category. This is somewhat better than most series, and the best results were obtained in repair of the ulnar nerve, also contrary to the general rule. Both results may be explained on the paucity of injured radial nerves in the group. Furthermore, the relative unimportance of the intrinsic muscles of the hand helps to explain the good ulnar results. In general, it was found that motor function eventually returned if there was sensory regeneration. One consistently poor result was in the adductor of the fifth finger, probably because of carelessness in splinting.

In repair of an ulnar nerve, sensory function is the primary consideration. Six of these 55 cases became septic, without ill effects. Age apparently was not a factor. The time when repair was carried out was inconsequential within broad limits. Of 9 cases in which repair was carried out in less than six hours, 8 were successful, whereas 11 of 12 cases repaired after one month were also successful. Four of the latter were done after more than two years, and 1 after more than four years. The average rate of regeneration was 1.2 mm. daily, with extremes of 0.5 and 3.5 mm. In the unsutured nerves studied, regeneration began at eleven weeks and was complete in thirty-six weeks.

In median-nerve injuries, repair was successful in 82 per cent of cases. That function of the opponens pollicis muscle is not always an infallible test of function when a laceration occurs at the wrist is borne out by the fact that this was normal in 6 such cases. This probably indicates that the muscle is innervated separately or by a twig given off above the wrist. The rate of regeneration was the same as that of the ulnar nerve, and, again, age played no part. However, results became poorer as the time interval between injury and repair increased.

The few cases of radial-nerve injury afforded good results in 78 per cent. Results in the recent period, however, were much better than formerly.

In nerve injuries associated with fractures, surgery was seldom required. Good results were obtained in 96 per

cent of cases, and the failures were due to gross inefficiency. It was instructive to learn that such injury followed rather than preceded open reduction of a fracture in some cases. This suggests that although identification of a nerve at operation is an admirable procedure, unnecessary retraction or manipulation merely leads to trouble.

Heretofore, there have been no satisfactory tests of prognosis in nerve injury, and this is a vital phase of the problem. Electrical excitability still affords the best means of evaluating this status of a nerve, and a new use of the galvanic, in contrast to the faradic, current (devised by Dr. Arthur L. Watkins) promises improved predictions regarding the need of operative repair.

Nothing new in nerve-repair technic has been added. It is believed that twisting is of minor importance unless of marked degree. In old cases, the neuroma must be resected and the nerve freed up as much as necessary to prevent tension during regeneration. Splinting is indispensable for the prevention of tension and of the loss of tone in the denervated muscles.

In his discussion of this paper, Dr. Bunnell stated that he had found sepsis of more consequence than here intimated. Furthermore, he considers lack of rotation critical, especially near the field of distribution of a nerve, where the bundles begin to have a definite place. Absence of opponens paralysis in median-nerve laceration is explained by a shift of innervation.

The next paper, by Dr. Henry C. Marble, of the Massachusetts General Hospital, entitled "Infections of the Hand," was devoted to some commonly overlooked problems in this vast field.

The staphylococcal carbuncles and different types of abscesses are usually easily recognized. The streptococcal infections are known to be a wildly spreading process, often heightened dangerously in hospital personnel by human passage. The septic human-bite wound is now being better understood but is still usually seen too late because of the alcoholic euphoria of so many of these patients.

Vaccination has not infrequently been mistaken for chancre or some serious ulcer. Gonococcal tenosynovitis closely simulates that caused by the streptococcus, there being no trauma. This is common in genitoinfectious-disease clinics but is rarely recognized in a hand clinic. About half the cases of nontraumatic tenosynovitis fall in this category when proper studies are done. If there is any suspicion or when there is a tenosynovitis of questionable etiology, a proper bacteriologic setup should be available in the operating room. If this diagnosis is confirmed, any incision should be closed without drainage.

The classic tuberculous joint involvement, with grating crepitation and fluctuation above and below the carpal ligament, is a relatively late stage. At any stage, the problem is essentially a medical one. Dr. Marble now advocates merely splinting and bed rest, the former choice of treatment, surgery, being retained for later use, if necessary.

Fungus infections are becoming increasingly common, and are particularly significant when secondary infection, with its concomitant cellulitis and other sequelas, occurs. This may prove an important field for the use of the relatively new, gramacidin treatment.

An unusual but difficult and interesting injury to treat is the "grease-gun hand," in which grease is pushed into the tissues under tremendous force. These injuries are probably best widely débrided if seen early, but unfortunately they are not often painful or otherwise troublesome for some days or at least hours.

In discussion, Dr. Bunnell stated that he still employs surgery for the eradication of tuberculosis, using wide and careful dissection. The chief advantage is one of speed in convalescence, but even this form may require months of postoperative immobilization. For tenosynovitis, he now employs a "trapdoor" incision over the site of tenderness, in addition to one in the cul-de-sac in the palm. However, it may be possible in the future, with the aid of chemotherapy, merely to carry out the latter incision.

In the next paper, Dr. Champ. Lyons, of the Massachusetts General Hospital, discussed "Chemotherapy of Hand Infections." The efficacy of any such treatment is proportional to the accuracy of the bacteriologic diagnosis and the intelligence employed in selecting the kind and amount of drug. Cultures should be incubated at proper temperatures: for example, finger-tip bacteria may grow only under their natural conditions of room temperature. Probably the most valuable single aid is a proper anaerobic medium, of which there are now several simple and efficient ones. Of the streptococci, Groups A, B, C and G all respond to the sulfonamide drugs. Group A, which is the commonest human pathogen, responds to the usual dosage in a short time, but the others should be exposed to higher levels for longer periods. Group D, of which the enterococci are important members, is nonresponsive and is best attacked by zinc peroxide. The staphylococcus, in general, is resistant unless all dead tissue is removed and the drugs are used locally. Human-bite infections, caused by fusobacteria and diphtheroids, are locally necrotic lesions that are treated best by wide débridement. If this is well done, the role of chemotherapy becomes minor. But sulfadiazine in small amounts over long periods has proved efficacious and is even better locally than zinc peroxide. Anthrax lesions respond well to sulfadiazine, but the malignant form should have supplementary specific antibacterial serum therapy. Actinomycosis has now been demonstrated to respond to sulfonamide therapy if this is continued for six to twelve months. Close follow-up examinations are advisable.

In employing local chemotherapy, one should understand that the mechanism of action is not the same as when the drugs are systemically administered. Several factors are involved. The solubility of sulfonamide drugs in serum varies greatly, sulfanilamide being about ten times as soluble as the others and on that account the drug of choice. But the persistence of drug as a foreign body and its cytotoxicity demand consideration. Sulfanilamide is most rapidly absorbed, whereas sulfapyridine has a strong foreign-body reaction. Although sulfathiazole is generally more bacteriostatic and of minor foreign-body irritation, it is highly cytotoxic. This is often overlooked when it is mixed with sulfanilamide. Sulfadiazine is midway between the extremes in all respects and is probably best used as an adjuvant to sulfanilamide, in a 25 per cent solution, especially when dressings are to be more than three days apart.

The final paper of the afternoon, by Dr. William E. Browne, of the Carney Hospital, was entitled "Dupuytren's Contracture." It was emphasized that trauma probably plays a definite etiologic role in certain cases. The pathologic changes usually involve the reticulum layer of the skin as well as the fascia, and skin grafts are therefore often necessary. In dissection, the careful excision of all ramifications of the fascia, especially the deep penetrating ones, is essential. Especial care should be taken to avoid injury to the underlying nerves and vessels and to preserve those supplying the digits.

In discussing this paper, Dr. Bunnell stated that trauma is seldom of direct consequence in pathogenesis. Surgery may merely reproduce the original condition unless great skill is exerted. Certain cases may need stage operations, and tenotomy may help as an initial procedure. Of the utmost benefit in the postoperative care is the immobilization of the proximal joints.

The evening meeting was held at the Boston Medical Library. Dr. Sterling Bunnell, of San Francisco, discussing "Reconstruction of the Hand," emphasized the fact that at least 50 per cent of hand injuries are industrial and compensation cases, in which good eventual functional results and immediate saving of time are urgent. Intelligent and well-conceived early treatment may prevent much of the later loss of time and function that is common in neglected cases. Two of the most valuable factors in accomplishing the desired results are the covering of the affected area with skin, even if a flap is necessary, and the splinting of the part in the position of function while everything except the affected part is kept in motion. Any surgeon engaged in this field should be trained in orthopedics, plastic surgery and neurosurgery. In general, tendons used in transplants should be of the same size as those lost, or improper function may well result. In reoperations in this field, one must guard against the inevitable tendency to open areas of potential infection too soon.

In the original examination of the part, exact figures on the amount of function should be recorded, as the result of both active and passive motions. The cause of limitation of function, whether nerve, vascular, bone or joint, should be accurately determined and recorded. In general, operations should be carried out in proper stages. Repair of joints and skin, which requires immobilization of the entire member, should be done before that of tendons, which demands mobilization relatively early. Every procedure should be considered from the standpoint of being worth while for the patient, doctor and insurance company. All operations on the hand should be carried out under a tourniquet and in an atraumatic fashion. The hand is "unbridled" by excision of all flexion contractures with the necessary underlying scar tissue. This also greatly improves the nutrition of the member. Internal scars are best removed en bloc, for these contract just as superficial ones do. Scars of secondary repair should be placed so as to prevent subsequent contractures and the possibility of dysfunction if keloids form. Although the latter abnormality of healing is certainly racial and familial to a large extent, there is increasing evidence that chronic irritation of an early scar probably plays a part.

The appropriate selection of the type of skin graft to be employed and its proper use are very important. On the whole, Reverdin grafts are practically never used, for the recipient scar is never strong and may break down under continual usage. Thin Thiersch grafts have many of the vital skin structures missing and very often contract later. But those taken with the Padgett dermatome at a thickness of 20/1000 of an inch are about the proper size, for they will develop subcutaneous fat and slide when necessary. It is preferable to employ full-thickness grafts where there is a possibility of sepsis. The tube type of graft is more aseptic than the buried graft and is therefore more frequently used. In placing the skin, one should continually guard against stretching until the graft is white, for in such circumstances the graft will be black soon afterward. Probably as essential as any single procedure in skin grafting is the guarding against hematoma by adequate hemostasis, proper drainage, constant and even pressure, and immobilization.

Nerves account for about 50 per cent of the function of the hand, and their early repair is therefore imperative. All severed nerves as far as the distal crease of the hand should be repaired. No axones are lost, and repair will result in regeneration if nutrition is good. Regeneration of nerves severed above the wrist requires approximately thirteen months, whereas that from wrist to finger tip consumes about seven months. This is about a finger segment a month. Regeneration of sensory nerves occurs irrespective of the time of repair up to about five years, whereas that of motor nerves is more problematical. However, there is nothing to be lost by trying a repair in all cases. In motor nerves, fibrous regeneration starts immediately, but there is little chance of success once response to electrical stimulation is lost. Age is of little significance in nerve regeneration, but nutrition of the part is of the utmost necessity. Nerves should never be immobilized on tension, for this will result in ischemia, with temporary or permanent paresis. In tendon lengthening, the joints are flexed successively and then later extended, starting with the proximal one. Nerve grafts have been successful in selected cases. This procedure is more effective in the smaller, better vascularized nerves, and the sural nerve has proved convenient and of the proper size for the donor site. One should always be careful not to allow axones outside the neurolemma lest subsequent neuromas occur.

Tendons are probably next in consequence to nerves in the hand. Since they do not function in a scar bed, even though they are intact, the scar is removed, and a graft is inserted. One may accomplish this by placing a fascial strip with its slick side toward the tendon, or by the use of the specialized fatty tissue known as "paratendon." The best sources of this are over the triceps tendon or under the deep fascia of the thigh. If the area is too cicatricial, an entire tendon assembly in the form of tendon and paratendon from the palmaris longus or dorsum of the foot may be transplanted. The healing of tendon occurs in the following stages: at the end of two weeks, there is connective-tissue union; at the end of three weeks, tendon fibers are growing but are not strong; and at the end of four weeks, the tendon fibers are strong. Immobilization does not add to the strength early but looks better, and is therefore usually carried out. But mobilization definitely adds to the strength later. Therefore, the best procedure is to immobilize for about fifteen days to bring about junction without undue reaction and adhesions. Then, the hand is mobilized for strength.

Tendon grafts account for about one third of all operations on tendons. They are usually carried out because of retraction, resection at the time of the original operation, poor tissue or the position of the injury (pulley). The small tendons encountered in the hand require no particular precautions, but large ones need fascia on both sides for nourishment. The palmaris longus tendon is present in 80 per cent of people. The extensor tendons of the toes may be employed, but the brevis should be left for function.

Moving pictures were presented showing the method of suturing tendons at a distance — a method whereby the proximal end is kept from retracting and a few fine silk sutures are all that is required to maintain approximation of the cut ends. Pull-out sutures, which allow strong suture material to be used and later removed after the tendon is firmly healed, are employed.

In conclusion, it was pointed out that the capsulectomy form of arthroplasty is good only for proximal joint fixation, for, in distal joints, instability results. This was in answer to a question concerning the treatment of fixation of disuse. For best stabilization of the wrist joint, removal of the proximal carpal row was suggested.

BOOK REVIEWS

Nephritis. By Leopold Lichtwitz, M.D. 8°, cloth, 328 pp., with 62 illustrations. New York: Grune and Stratton, 1942. $5.50.

Every physician interested in nephritis may well read this book with interest and profit. No other volume in English affords the kind and amount of information that it contains. It is necessary to point out however, that this is due to the fact that it expresses a highly individualistic and personal point of view — that of Lichtwitz on the kidney. It embodies no comprehensive review of present-day American viewpoints. Furthermore, its point of view, however valid it may be, is one that was reached some years ago. Most of the investigative data on which it is based were gathered before 1925. Of the four hundred and fifty bibliographic references, fewer than thirty concern work done since 1935.

The mere fact that the anatomic studies of such men as Jean Oliver and the clinical and physiologic work of investigators like Goldblatt and his followers, Page, Smith and his collaborators and dozens of others are all but ignored does not detract from the worth of the volume if it is accepted for what it is; the omissions are deliberate. One may be permitted to doubt, however, whether the patient with nephritis will live longer or more comfortably if handled according to Lichtwitz than if treated as he would be treated in any modern American clinic, or even that the state of his kidneys will be better understood. On the other hand, it is refreshing to read a book that totally dispenses with the current pseudomathematical formulas and carefully abstruse jargon of the renal physiologists.

The Principles of Neurological Surgery. By Loyal Davis, M.D., Ph.D., D.Sc. (Hon.). Second edition, thoroughly revised. 8°, cloth, 503 pp., with 154 illustrations. Philadelphia: Lea and Febiger, 1942. $7.00.

The aim of this book is to give to the average physician and student an insight into what may be accomplished by neurologic surgery as a means of treating nervous diseases. The special branch of surgery dealing with the nervous system is of such recent development that this is one of the first textbooks to deal with the subject as a whole. The author has condensed into a book of moderate size his own experience and the monographic literature on the subject. The result is a sound book, sufficiently detailed for practical purposes and broadly based enough to be of value to all neurosurgeons. The volume reflects, moreover, the rapid strides in neurologic surgery since Horsley removed a cord tumor and Keen a brain tumor, fifty years ago.

The first chapter on diagnosis is the weakest part of the book and might well be omitted from future editions. Subsequent chapters on craniocerebral injuries, tumors, and spinal-cord and peripheral-nerve injuries are sound. The surgery of the autonomic nervous system, epileptiform seizures and essential hypertension are also considered, but with less sureness. The illustrations are adequate. If, as the author, hopes, this book will give the practitioner a better insight into these complicated problems and allow the patient with operable lesions to reach the hands of the surgeon more quickly, the volume will justify its publication.

A Manual of Allergy for General Practitioners. By Milton B. Cohen, M.D. 12°, cloth, 156 pp. New York: Paul B. Hoeber, Incorporated, 1941. $2.00.

The boundaries of the field of allergy are still so amorphous that it is extremely easy for the writer of a book on the subject to go astray. We are all familiar with the type of book whose author has been carried away by the esoteric and melodramatic aspects of his cases. The skillful detective work evokes the admiration of the reader but also leaves a residue of doubt and disbelief. The everyday, common-sense practitioner is suspicious of thaumaturgy, since it is not given to most of us to work very many miracles in an ordinary lifetime.

Other books on allergy have lost themselves in the morass of immunology, a subject in which the general practitioner is rarely certain of his depth.

Dr. Cohen has skillfully avoided these mistakes. He has packed an extraordinary amount of useful information into a small space. His style is clear, his definitions satisfying, and his common sense everywhere apparent. Occasionally, in some aspects of the subject, — especially on the importance of bone scorings, taken as an index of active allergy, — there is still some difference of opinion. On the other hand, a small manual is not an arena for controversial subjects, and a rare statement more dogmatic than the circumstances warrant may not be out of place.

For the student or general practitioner who has not yet invested in a textbook of allergy, this manual is an excellent introduction to the subject. For those who wish a working knowledge of allergy, it will more than suffice.

Perineopelvic Anatomy from the Proctologist's Viewpoint. By R. V. Gorsch, M.D. 8°, cloth, 298 pp., with 157 illustrations. New York: The Tilghman Company, 1941. $8.00.

This is not a textbook of surgical technic but an authoritative monograph of the applied anatomy of the perineum and pelvis from the proctologist's viewpoint. Dr. Lynch, in his foreword, identifies the author as one who is advanced in knowledge of the pelvic outlet.

The text is divided into nine chapters, dealing respectively with the pelvis and pelvic floor, the anal canal, the anorectal musculature, the levatores ani, the rectum and sigmoid, the perineopelvic spaces, the pelvic fascia, the pelvic lymphatics and the nerve supply to the colon, rectum and anal canal. There is a bibliography of selected references at the close of each chapter. The work is based on the author's experience in the practice and teaching of proctology and on a series of excellent personal dissections represented, with some additions from other sources, by many admirable illustrations, some of which are full-page plates, two in colors.

One is glad to note that Dr. Gorsch retains the term "triangular ligament" instead of the misleading modern term "urogenital diaphragm." The occasional errors, which creep into any text, no matter how carefully prepared, will undoubtedly be corrected in a second edition. From the anatomist's standpoint, the work is virtually perfect, and the author is to be congratulated on its successful performance. It will be of lasting value to proctologists and anatomists alike.